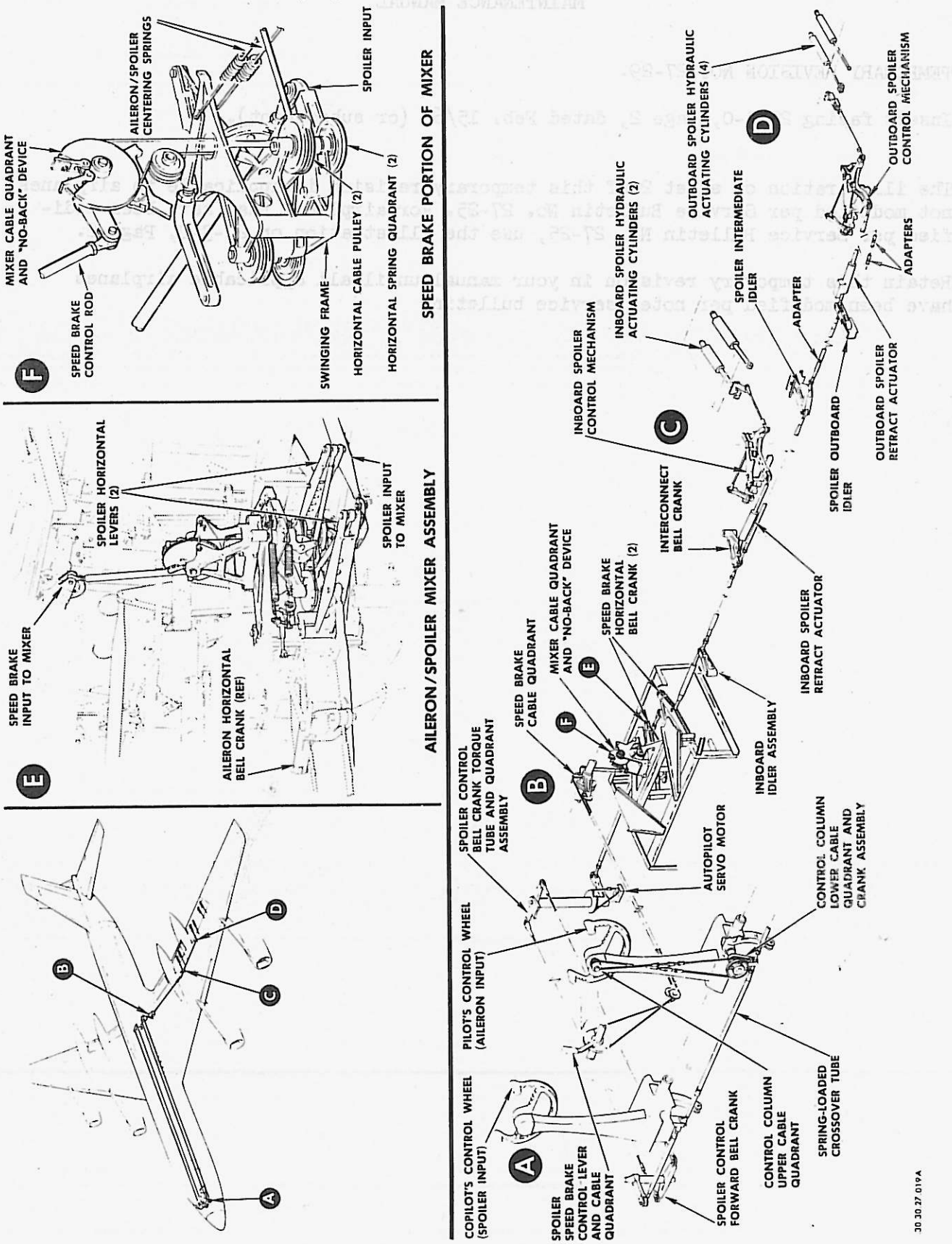
TEMPORARY REVISION NO. 27-29.

Insert facing 27-3-0, Page 2, dated Feb. 15/63 (or subsequent).

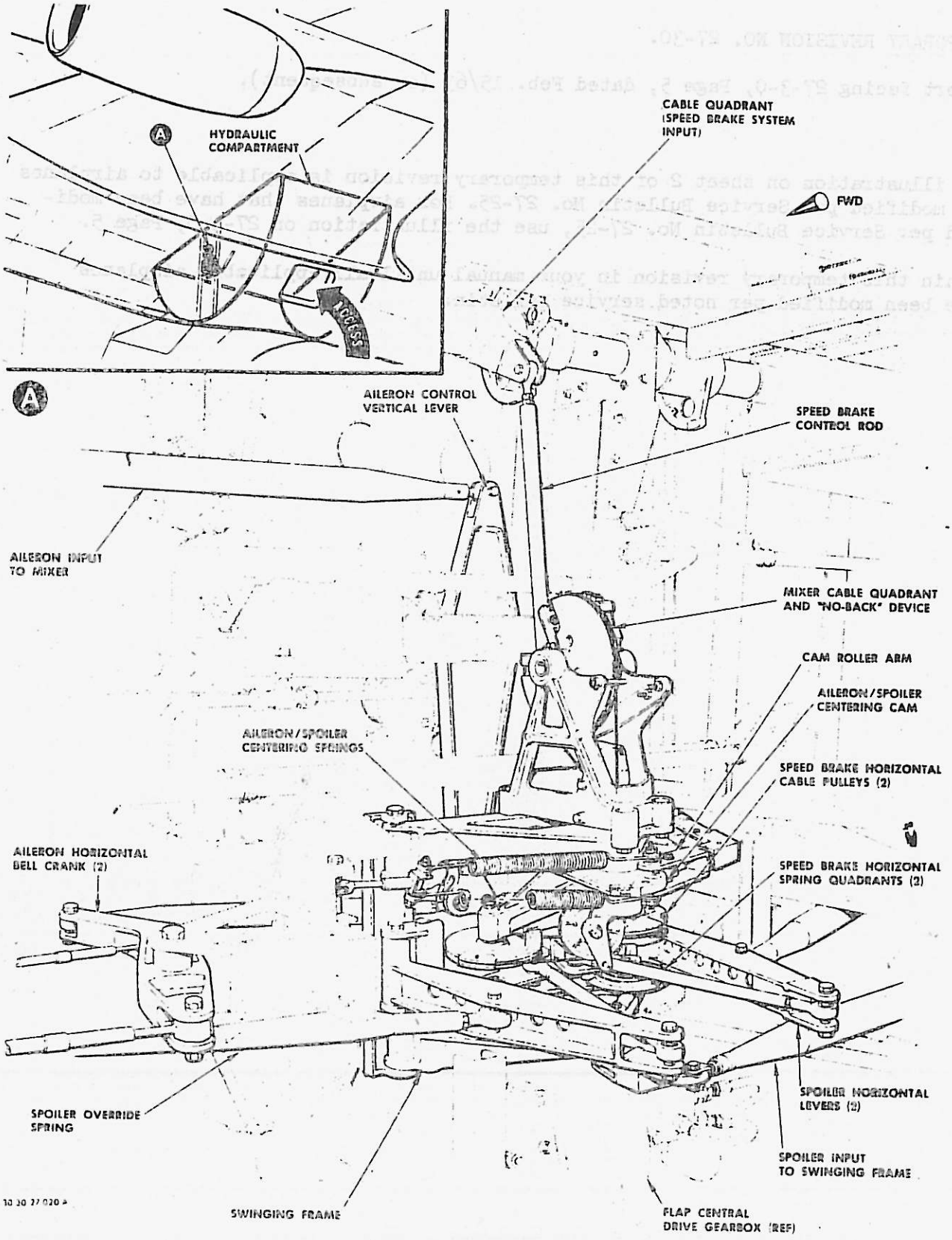
The illustration on sheet 2 of this temporary revision is applicable to airplanes not modified per Service Bulletin No. 27-25. For airplanes that have been modified per Service Bulletin No. 27-25, use the illustration on 27-3-0, Page 2.

Retain this temporary revision in your manual until all applicable airplanes have been modified per noted service bulletin.

TEMPORARY REVISION NO. 27-29.



TEMPORARY REVISION NO. 27-30.



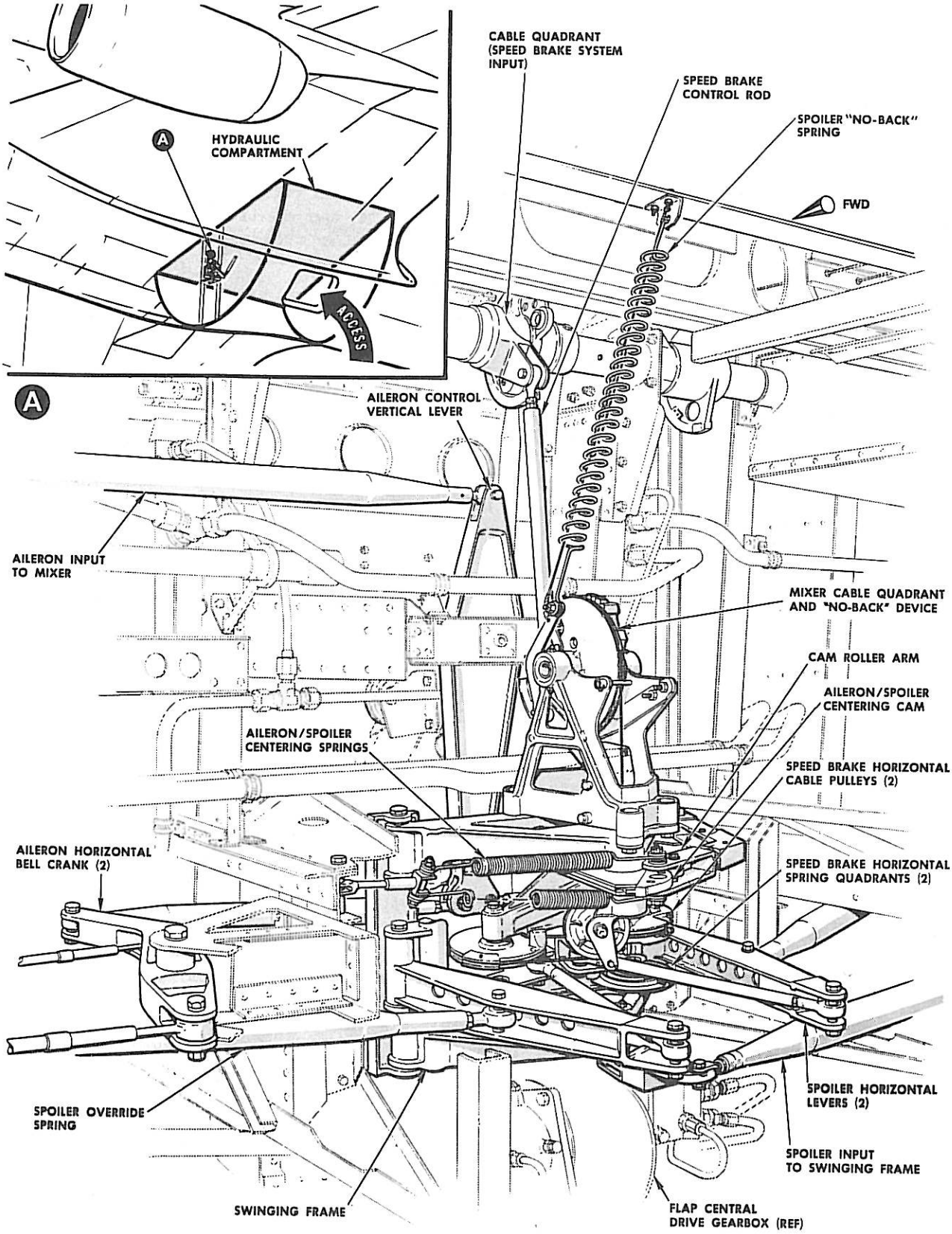
Spoiler/Speed Brake Mixer Assembly
Figure 3

TEMPORARY REVISION NO. 27-30.

Insert facing 27-3-0, Page 5, dated Feb. 15/63 (or subsequent).

The illustration on sheet 2 of this temporary revision is applicable to airplanes not modified per Service Bulletin No. 27-25. For airplanes that have been modified per Service Bulletin No. 27-25, use the illustration on 27-3-0, Page 5.

Retain this temporary revision in your manual until all applicable airplanes have been modified per noted service bulletin.


A
HYDRAULIC COMPARTMENT
ACCESS
A
CABLE QUADRANT (SPEED BRAKE SYSTEM INPUT)
SPEED BRAKE CONTROL ROD
SPOILER "NO-BACK" SPRING
FWD
AILERON CONTROL VERTICAL LEVER
AILERON INPUT TO MIXER
MIXER CABLE QUADRANT AND "NO-BACK" DEVICE
CAM ROLLER ARM
AILERON/SPOILER CENTERING CAM
AILERON/SPOILER CENTERING SPRINGS
SPEED BRAKE HORIZONTAL CABLE PULLEYS (2)
AILERON HORIZONTAL BELL CRANK (2)
SPEED BRAKE HORIZONTAL SPRING QUADRANTS (2)
SPOILER HORIZONTAL LEVERS (2)
SPOILER OVERRIDE SPRING
SPOILER INPUT TO SWINGING FRAME
SWINGING FRAME
FLAP CENTRAL DRIVE GEARBOX (REF)

.30.30.27.020 B

The swinging frame (with quadrants) is the portion of the mixer which causes the spoiler system to either operate in conjunction with the ailerons or to act as speed brakes. With the swinging frame remaining stationary, the quadrants can be rotated by movement of the speed brake cable system. The quadrants are spring-loaded in order to insure that they will return to a 0-degree speed brake position in the event that a cable driving the quadrant should fail and to provide feel for the speed brake control system. Rotational motion of the quadrants is transmitted into linear motion of the push-pull rods which operate the hydraulic control valves. For speed brake operation, the motion of the push-pull rods to the control valves is either inboard or outboard concurrently; this causes the spoiler surfaces to move up or down together.

The swinging frame of the spoiler/speed brake mixer is connected to the spoiler selector valves by a system of push-pull rods and bell cranks. Short push-pull rods connect each side of the swinging frame to a horizontal bell crank on each side of the mixer. A spring-loaded cartridge connects each horizontal bell crank to an idler crank in the hydraulic compartment. In the event of a jam in the spoiler system in one wing, the pilot can operate the spoilers in the opposite wing by collapsing the spring-loaded cartridge on the jammed side. Additional push-pull rods extend outboard from the idler cranks and transmit the mixer output to the series-connected control servo selector valves in the inboard and outboard spoiler control mechanisms. Each spoiler control mechanism contains an input and followup mixing bell crank which controls the position of a dual flow hydraulic selector valve. The selector valve controls the flow of two independent hydraulic systems which actuate separate spoiler actuators. The followup mechanism on each spoiler closes the selector valve when the spoiler reaches the position corresponding to the position of the speed brake handle and control wheel. A tension spring on the selector valve input arm opens the valve in the direction required to retract the spoiler in the event of control or followup severence.

An electro-mechanical actuator installed in each selector valve push-pull rod enables the pilot to lower either the inboard or the outboard spoilers without affecting the aileron or speed brake action of the spoilers still extended. The electro-mechanical actuators are controlled by an emergency pitch control switch on the pilots' pedestal. The selective control of the inboard and outboard spoilers provides additional pitch control in the event of a jammed stabilizer.

The autopilot aileron servo is connected by cables to a quadrant located outboard of the mixer on the right-hand side. This autopilot servo operates the spoilers directly through the mixer and the ailerons indirectly through the spring-loaded interconnect between the copilot's and pilot's control columns. Spoiler position transmitters connected to the inboard spoilers provide feedback signals to the autopilot. For information regarding the operation of the spoiler position transmitters, refer to Chapter 24, AUTOPILOT.

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-31.

Insert facing 27-3-0, Page 7, dated Feb. 15/63 (or subsequent).

The instructions in this temporary revision are applicable to airplanes not modified per Service Bulletin No. 27-25. For airplanes that have been modified per Service Bulletin No. 27-25, use the instructions on 27-3-0, Page 7.

Retain this temporary revision in your manual until all applicable airplanes have been modified per noted service bulletin.

Page 7, delete last two sentences in fourth paragraph.

4. Spoiler/Speed Brake Control and Operation

The spoilers, when utilized as speed brakes, are controlled by the fore and aft movement of the spoiler speed brake handle mounted on the left side of the pilot's pedestal, adjacent to the throttle levers. Speed brake handle travel is divided into a NORMAL and RESTRICTED range. It is permissable to move the speed brake handle through the RESTRICTED range during ground testing.

A quadrant with attached cables is connected to the speed brake handle. These cables extend down to two pulleys below the flight compartment floor and are then routed aft to a quadrant in the hydraulic compartment at fuselage station 970. A push-pull rod connects the quadrant to a cable quadrant located on top of the aileron spoiler mixer assembly. A set of cables attached to the mixer assembly quadrant, leads down through the common pivot point of the mixer assembly swinging frame. The cables continue down and around adjacent pulleys, then forward and around two quadrants on the swinging frame. These quadrants move the horizontal bell cranks and spoiler push-pull rods inboard and outboard in unison in response to movement of the speed brake handle.

The quadrants, attached to the swinging frame, are connected to spring assemblies which will return them to the retract position in the event that a cable in the swinging frame should break. This action will allow all spoilers to drop down to the retracted position if the control wheels are in neutral. The lateral control function of the spoilers will not be affected by this condition since the input to the swinging frame and spoiler cranks is from a different source during the lateral control operation.

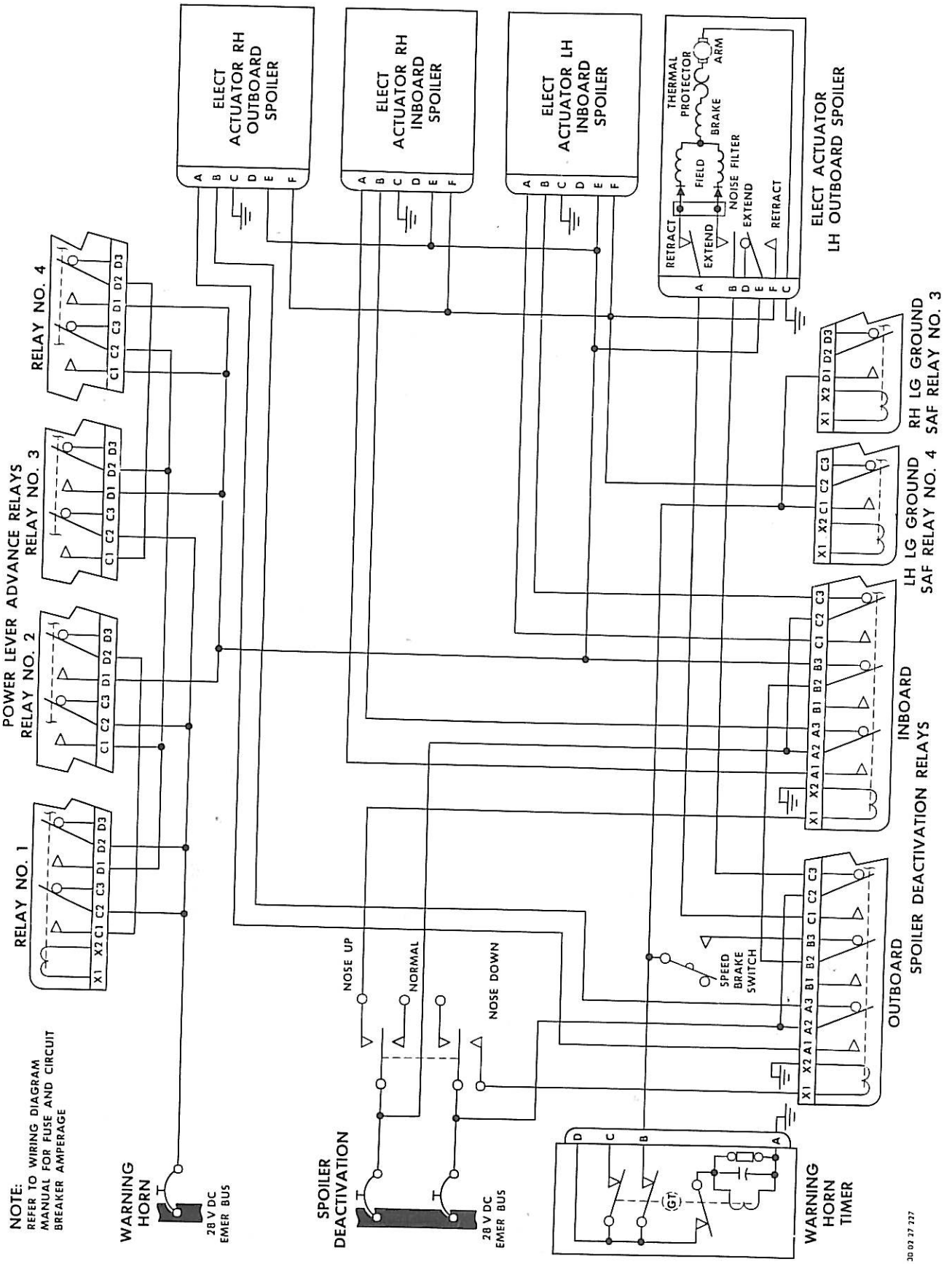
A "no-back" device in the quadrant assembly on top of the mixer prevents the speed brake system from being put into motion when the aileron control wheel is operated. Brake shoes are included in the device to cause a jamming action which prevents movement until a movement in the speed brake system frees them. Motion from the speed brake handle in the flight compartment releases the "no-back" device and operates a cable system which is in turn connected to the two cable quadrants mounted on the swinging frame of the mixer assembly. A "no-back" spring is installed between the mixer cable quadrant and the airplane structure. This spring aids in eliminating chatter and reduces friction in the spoiler control irreversible mechanism.

The speed brake handle and the spoiler selector switch are connected to the warning horn through the "3 seconds on - 1 second off" circuit in the warning horn timer. When the airplane is on the ground, advancing two or more of the power levers to TAKEOFF power will cause the warning horn to sound if the speed brake handle is out of the retract detent or if the selector switch is not positioned in NORM. In flight, the warning horn will sound if one or more of the power levers are advanced to TAKEOFF power when the speed brake handle is out of the retract detent and the spoiler selector switch is positioned in NORM. As a precaution against a malfunction of any of the electro-mechanical actuators in the selector valve push-pull rods, the warning horn will sound when two of the power levers are advanced to

TAKEOFF power if the spoiler selector switch is in NORM and one or more of the actuators are not in the normal position. A diagram of the spoiler retract and speed brake position warning system is shown in Figure 4.

5. Spoilers

Two spoilers are mounted on the upper surface of each wing just forward of the inboard and outboard flaps. Each inboard spoiler is divided into two sections, each outboard spoiler into three sections. The sections of each spoiler are connected by expansion joints to allow for wing bending under varying load conditions. Each spoiler section is mounted on the wing trailing edge structure at two points, except the center outboard section which is mounted at three hinge points. For a description of the spoiler structure, refer to Chapter 57, WINGS.



Spoiler Retract and Speed
Brake Position Warning Circuit
Figure 4

SPOILER CONTROL SYSTEM - TROUBLE SHOOTING

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
1. EXCESSIVE FORCE REQUIRED TO ROTATE AILERON-SPOILER CONTROL WHEELS	
	WARNING: WHEN AN ADJUSTMENT IS MADE OR A COMPONENT REPLACED IN THE SPOILER OR SPEED BRAKE CONTROL SYSTEMS, A FUNCTIONAL TEST MUST BE PERFORMED. REFER TO ADJUSTMENT/TEST SPOILER-SPEED BRAKE FUNCTIONAL TEST.
A. Excessive tension on aileron or spoiler cables in fuselage.	Refer to 27-1-0, AILERON CONTROL SYSTEM - TROUBLE SHOOTING.
B. Excessive frictional drag on aileron or spoiler system components in the fuselage.	Refer to 27-1-0, AILERON CONTROL SYSTEM - TROUBLE SHOOTING.
C. Excessive frictional drag on spoiler system components in mixer or wings.	Check each of the spoiler control system components from the aft spoiler bell crank through the mixer to the spoiler surfaces. Correct or replace faulty components as necessary, and test system (refer to Adjustment/Test Spoiler-Speed Brake Functional Test).
2. EXCESSIVE FORCE REQUIRED TO MOVE SPOILER-SPEEDBRAKE CONTROL HANDLE	
A. Excessive tension on speed brake cable system.	Check speed brake cable tension in fuselage and mixer assembly (refer to 27-3-0, Adjustment/Test). If cable tensions are incorrect, rerig speed brake system.
B. Excessive frictional drag on speed brake system components in mixer.	Check each component in system through mixer to spoiler surface in each wing. Correct or replace faulty components as necessary and test system (refer to Adjustment/Test Spoiler Speed Brake Functional Test). Close or replace doors or access panels opened during trouble shooting.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION

3. SPEED BRAKE CHATTERS WHEN SPEED BRAKE HANDLE IS MOVED FORWARD

A. Brake shoes in speed brake mixer quadrant are not set properly.	Turn aft lower adjusting screw in approximately 1 turn using 1/4 turn increments. At each increment, actuate speed brake handle through a complete cycle to check improvement in chatter. When chatter has been eliminated, back aft lower brake adjusting screw out slightly to the point where the chatter just starts to be felt in the speed brake handle. NOTE: Complete elimination of chatter results in excessive force required to move handle from full speed brake to stowed position. Check irreversible action of brake shoes by setting speed brake handle at approximately mid-travel and pulling spoiler horizontal control arms in mixer inboard. Check that minimum force required to override irreversible action of brake shoes is 20 pounds applied to aft end of each spoiler control arm. Test speed brake handle operation (refer to Adjustment/Test - Spoiler/Speed Brake System Functional Test).

4. SPOILER UPFLOATS IN HANDS-OFF LEVEL FLIGHT WITH LATERAL TRIM WITHIN ACCEPTED VALUES AND ENGINES OPERATING AT CRUISING POWER

A. Spoilers not properly rigged.	If spoiler upfloats more than one inch it will be necessary to rerig spoiler/speed brake linkage (refer to Adjustment/Test - Adjust Spoiler System). NOTE: The prefered method for correcting any spoiler upfloat is to defuel the airplane and rerig the spoiler/speed brake system per 27-3-0, Adjustment/Test - Adjust Spoiler System. However, if spoiler upfloat does not exceed one inch and it is impractical to defuel the airplane, an alternate method for correcting minor spoiler upfloat is acceptable, as follows:

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
4. SPOILER UPFLOATS IN HANDS-OFF LEVEL FLIGHT WITH LATERAL TRIM WITHIN ACCEPTED VALUES AND ENGINES OPERATING AT CRUISING POWER (CONT)	
	Determine that spoiler/speed brake linkage in fuselage is adjusted per 27-3-0, paragraphs 1.E and 1.I.
	If linkage is adjusted per 27-3-0, paragraphs 1.E. and 1.I, disconnect push-pull rod from valve arm of up-floating spoiler, shorten push-pull rod one-half turn only, and torque paint check nut on rod end.
	NOTE: No adjustment may be made to a push-pull rod with a torque painted check nut without a complete check of the spoiler system.

SPOILER CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Adjustment/Test Adjust Spoiler System (see Figures 201 and 202)

A. General.

The aileron and spoiler systems are adjusted separately, however, the aileron and spoiler cable systems in the fuselage as far aft as the aileron and spoiler aft bell cranks are usually adjusted in the same operation. Refer to 27-1-0, Adjustment/Test Adjust Aileron System for instructions for adjusting the spoiler cables in the fuselage forward of the aft spoiler bell crank.

B. Spoiler Surface Travel Data (see Figure 203).

(1) General.

Angular measurements are taken with a protractor and reflect the amount of surface rotational travel. A linear measurement is the straight line distance, in inches, between a noted point on the surface in the streamline position and the same point on the surface in the deflected position.

C. Equipment Required.

(1) Standard cable tensiometer.

(2) Thermometer.

(3) Deleted.

(4) Deleted.

(5) Tool No. 22-04302-16 to lock control wheels in neutral.

(6) The following or equivalent index pins:

(a) Three 22-J107-2.0

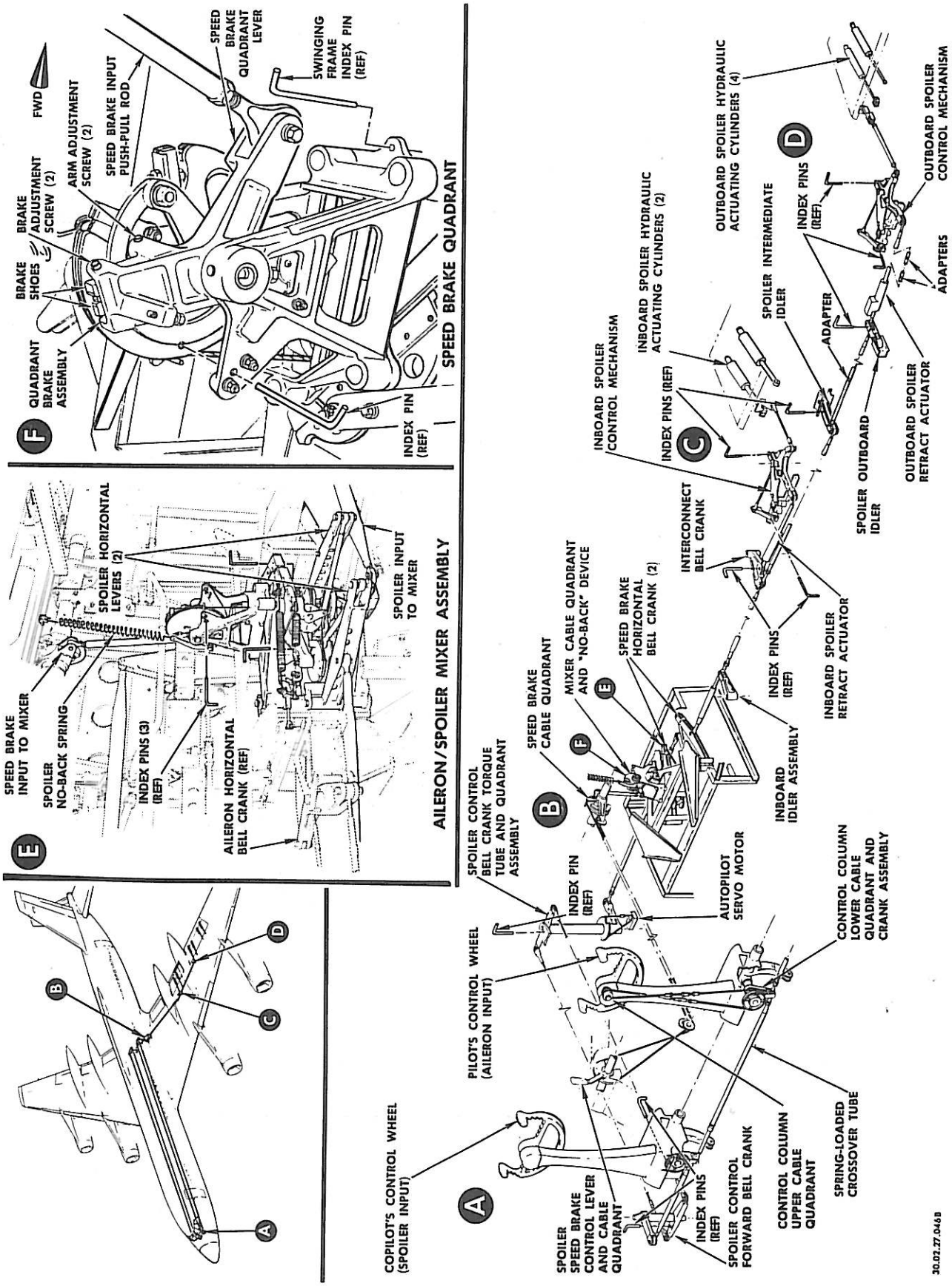
(b) One 22-J107-5.0

(c) Two 22-J107-2.5

D. Adjust Spoiler Hydraulic Cylinders.

(1) Remove bolts and disconnect piston rod end bearings of two inboard and four outboard spoiler hydraulic cylinders in each wing from spoiler horns.

(2) Check that spoilers are in "fully retracted" position.


F
QUADRANT BRAKE ASSEMBLY
BRAKE SHOES
BRAKE ADJUSTMENT SCREW (2)
ARM ADJUSTMENT SCREW (2)
FWD
SPEED BRAKE INPUT PUSH-PULL ROD
SPEED BRAKE QUADRANT LEVER
SWINGING FRAME INDEX PIN (REF)
INDEX PIN (REF)
SPEED BRAKE QUADRANT
E
SPEED BRAKE INPUT TO MIXER
SPOILER NO-BACK SPRING
SPOILER HORIZONTAL LEVERS (2)
INDEX PINS (3) (REF)
AILERON HORIZONTAL BELL CRANK (REF)
SPOILER INPUT TO MIXER
AILERON/SPOILER MIXER ASSEMBLY
A
B
C
D
SPOILER CONTROL BELL CRANK TORQUE TUBE AND QUADRANT ASSEMBLY
SPEED BRAKE CABLE QUADRANT
MIXER CABLE QUADRANT AND "NO-BACK" DEVICE
SPEED BRAKE HORIZONTAL BELL CRANK (2)
INTERCONNECT BELL CRANK
INBOARD SPOILER CONTROL MECHANISM
INBOARD SPOILER HYDRAULIC ACTUATING CYLINDERS (2)
OUTBOARD SPOILER HYDRAULIC ACTUATING CYLINDERS (4)
SPOILER INTERMEDIATE IDLER
INDEX PINS (REF)
OUTBOARD SPOILER CONTROL MECHANISM
INDEX PINS (REF)
ADAPTER
ADAPTERS
INDEX PIN (REF)
AUTOPILOT SERVO MOTOR
INBOARD IDLER ASSEMBLY
INDEX PINS (REF)
INBOARD SPOILER RETRACT ACTUATOR
SPOILER OUTBOARD IDLER
OUTBOARD SPOILER RETRACT ACTUATOR
PILOT'S CONTROL WHEEL (AILERON INPUT)
CONTROL COLUMN LOWER CABLE QUADRANT AND CRANK ASSEMBLY
COPILOT'S CONTROL WHEEL (SPOILER INPUT)
SPOILER SPEED BRAKE CONTROL LEVER AND CABLE QUADRANT
INDEX PINS (REF)
SPOILER CONTROL FORWARD BELL CRANK
CONTROL COLUMN UPPER CABLE QUADRANT
SPRING-LOADED CROSSOVER TUBE
30.02.27.046B

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-32.

Insert facing 27-3-0, Page 202, dated Feb. 15/63 (or subsequent).

The illustration on sheet 2 of this temporary revision is applicable to airplanes not modified per Service Bulletin No. 27-25. For airplanes that have been modified per Service Bulletin No. 27-25, use the illustration on 27-3-0, Page 202.

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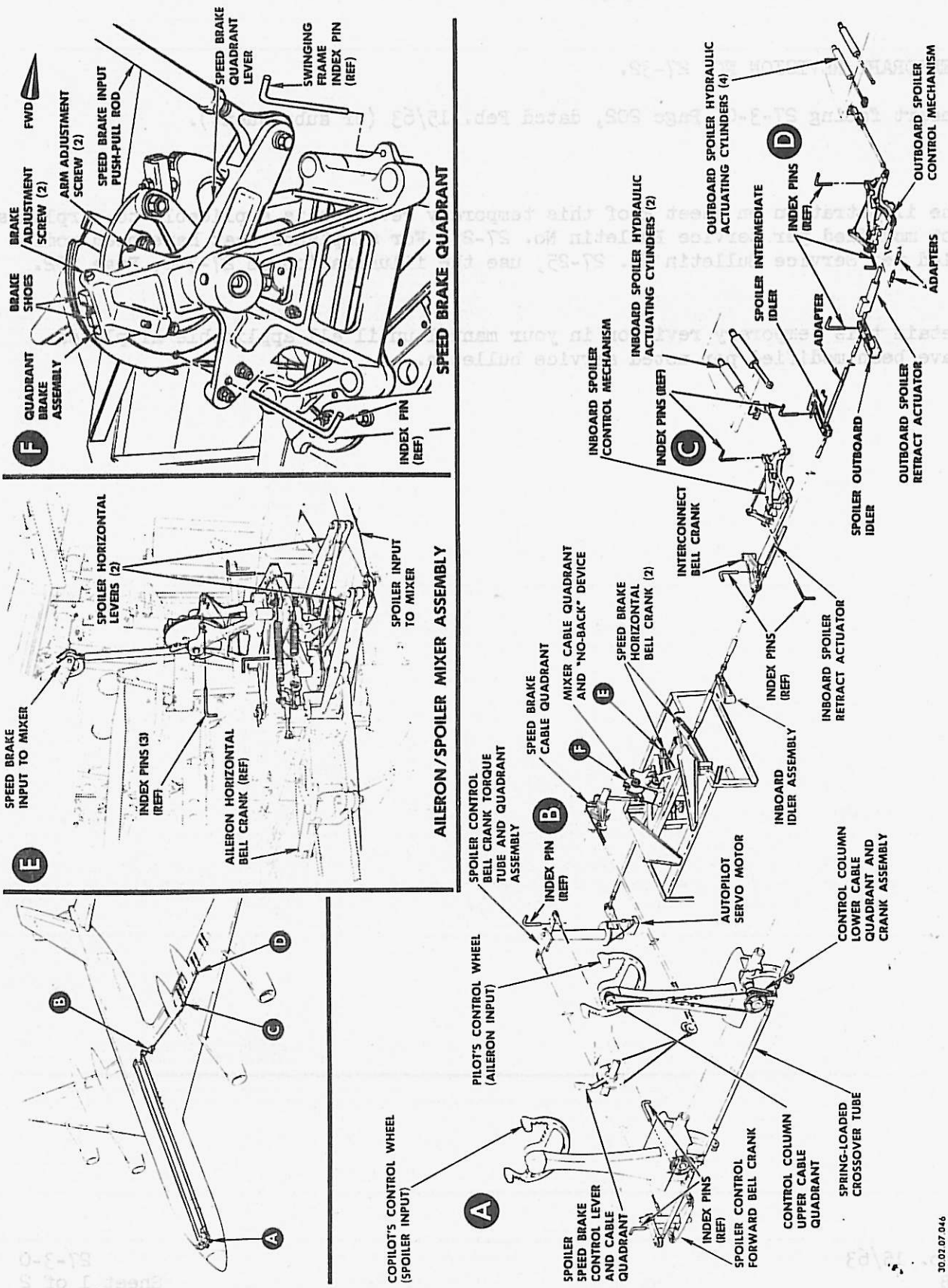
F
QUADRANT BRAKE ASSEMBLY
BRAKE SHOES
BRAKE ADJUSTMENT SCREW (2)
ARM ADJUSTMENT SCREW (2)
FWD
SPEED BRAKE INPUT PUSH-PULL ROD
SPEED BRAKE QUADRANT LEVER
SWINGING FRAME INDEX PIN (REF)
INDEX PIN (REF)
SPEED BRAKE QUADRANT
E
SPEED BRAKE INPUT TO MIXER
SPOILER HORIZONTAL LEVERS (2)
INDEX PINS (3) (REF)
AILERON HORIZONTAL BELL CRANK (REF)
SPOILER INPUT TO MIXER
AILERON/SPOILER MIXER ASSEMBLY
A
B
C
D
COPILOT'S CONTROL WHEEL (SPOILER INPUT)
PILOT'S CONTROL WHEEL (AILERON INPUT)
SPOILER CONTROL BELL CRANK TORQUE TUBE AND QUADRANT ASSEMBLY
INDEX PIN (REF)
SPEED BRAKE CABLE QUADRANT
MIXER CABLE QUADRANT AND "NO-BACK" DEVICE
SPEED BRAKE HORIZONTAL BELL CRANK (2)
AUTOPILOT SERVO MOTOR
INBOARD IDLER ASSEMBLY
INDEX PINS (REF)
INTERCONNECT BELL CRANK
INBOARD SPOILER RETRACT ACTUATOR
INBOARD SPOILER CONTROL MECHANISM
INBOARD SPOILER HYDRAULIC ACTUATING CYLINDERS (2)
INDEX PINS (REF)
SPOILER OUTBOARD IDLER
SPOILER INTERMEDIATE IDLER
ADAPTER
OUTBOARD SPOILER HYDRAULIC ACTUATING CYLINDERS (4)
INDEX PINS (REF)
OUTBOARD SPOILER RETRACT ACTUATOR
OUTBOARD SPOILER CONTROL MECHANISM
ADAPTERS
CONTROL COLUMN LOWER CABLE QUADRANT AND CRANK ASSEMBLY
SPRING-LOADED CROSSOVER TUBE
CONTROL COLUMN UPPER CABLE QUADRANT
SPOILER CONTROL FORWARD BELL CRANK
INDEX PINS (REF)
SPOILER SPEED BRAKE CONTROL LEVER AND CABLE QUADRANT
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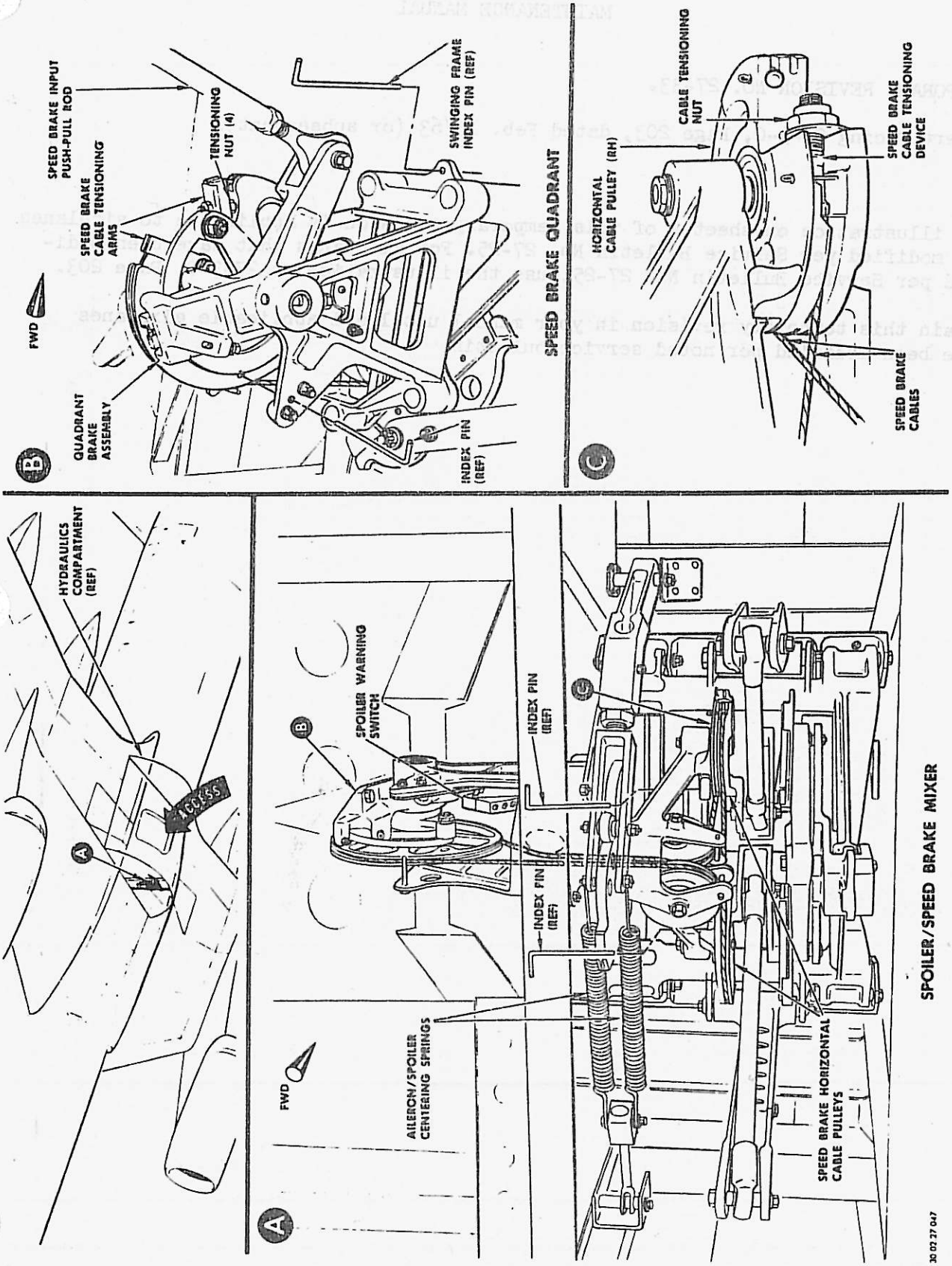
TEMPORARY REVISION NO. 27-33.



Spoiler/Speed Brake Mixer Cable
Adjustment
Figure 202

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-33.

Insert facing 27-3-0, Page 203, dated Feb. 15/63 (or subsequent).

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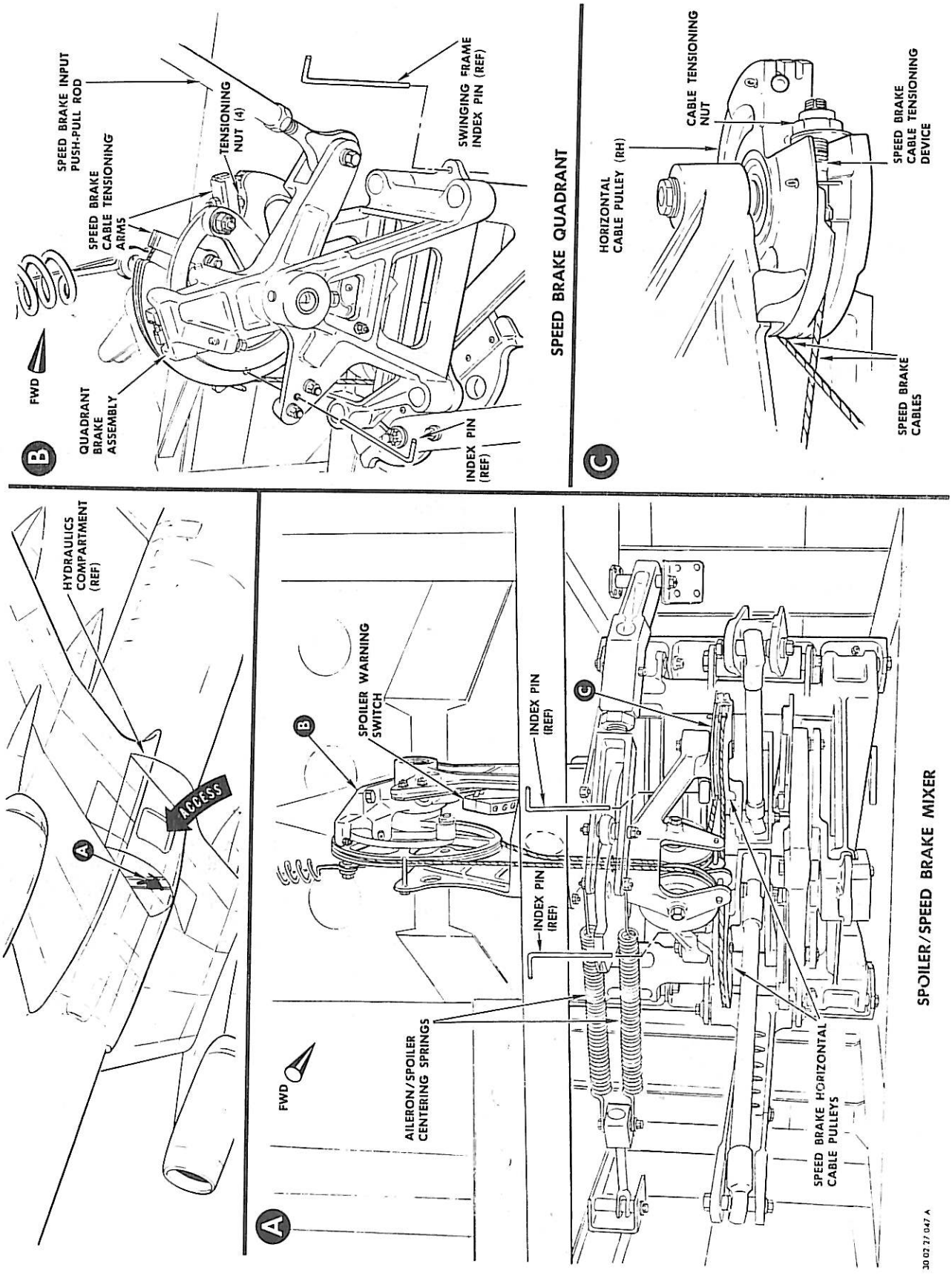
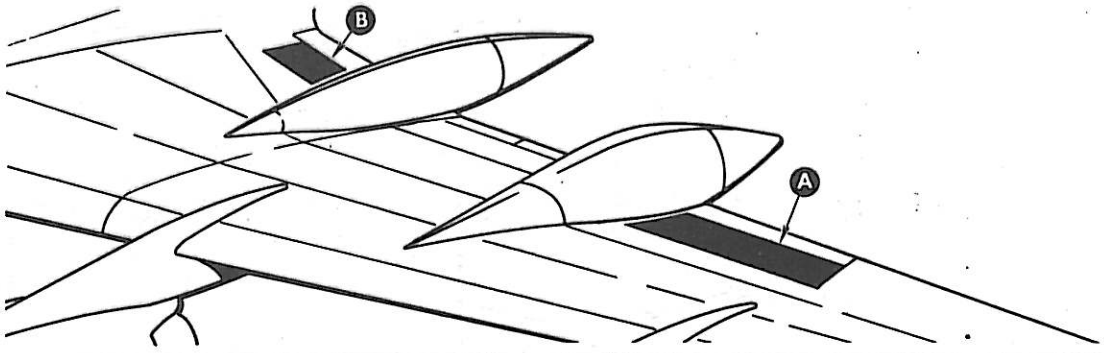
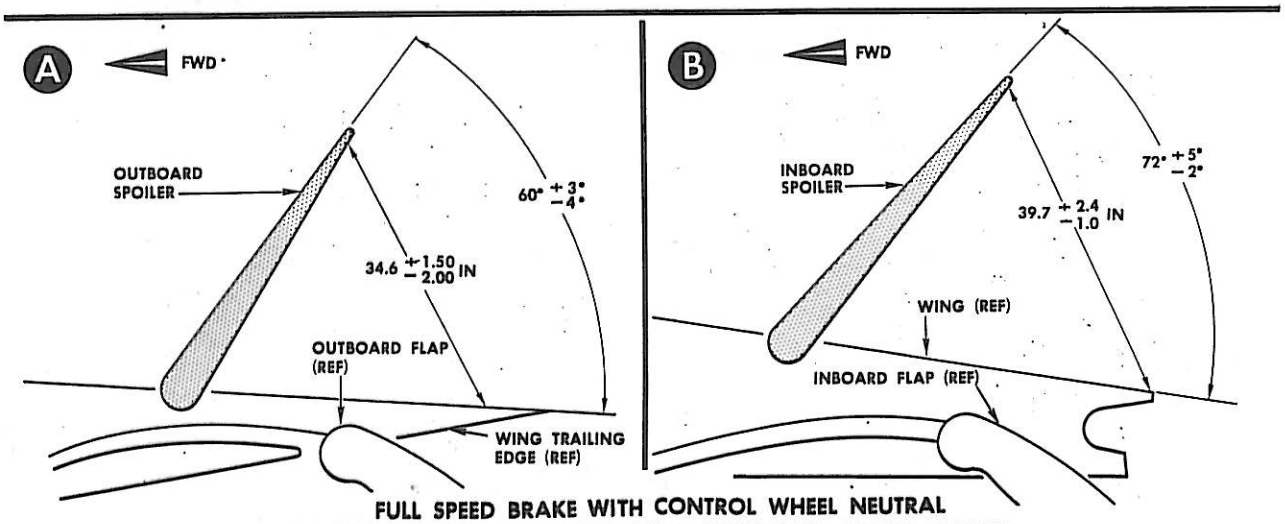
Retain this temporary revision in your manual until all applicable airplanes have been modified per noted service bulletin.


SPEED BRAKE QUADRANT
SPOILER/SPEED BRAKE MIXER
SPEED BRAKE INPUT PUSH-PULL ROD
SPEED BRAKE CABLE TENSIONING ARMS
TENSIONING NUT (4)
SWINGING FRAME INDEX PIN (REF)
FWD
QUADRANT BRAKE ASSEMBLY
INDEX PIN (REF)
HORIZONTAL CABLE PULLEY (RH)
CABLE TENSIONING NUT
SPEED BRAKE CABLE TENSIONING DEVICE
SPEED BRAKE CABLES
HYDRAULICS COMPARTMENT (REF)
ACCESS
SPOILER WARNING SWITCH
INDEX PIN (REF)
INDEX PIN (REF)
AILERON/SPOILER CENTERING SPRINGS
SPEED BRAKE HORIZONTAL CABLE PULLEYS
30 07 27 047 A





FULL SPEED BRAKE WITH CONTROL WHEEL NEUTRAL OR FULL CONTROL WHEEL ROTATION WITH SPEED BRAKE STOWED

NOTE:

1 INBOARD SPOILER
LINEAR MEASUREMENT IS TAKEN FROM A CENTER POINT ON SPOILER INBOARD TRAILING EDGE TO POINT ON WING, WHICH IS ESTABLISHED BY PLACING MARK ON WING AT SPOILER INBOARD TRAILING EDGE WITH SPOILER IN RETRACTED POSITION.

2 OUTBOARD SPOILER
LINEAR MEASUREMENT IS TAKEN FROM A CENTER POINT ON SPOILER OUTBOARD TRAILING EDGE TO A POINT ON WING WHICH IS ESTABLISHED BY PLACING MARK ON WING AT SPOILER OUTBOARD TRAILING EDGE WITH SPOILER IN RETRACTED POSITION.

	ANGULAR DEFLECTION	LINEAR DEFLECTION	LOCATION OF POINT ON SURFACE FOR DETERMINING LINEAR MEASUREMENTS
	UP	UP	
	FULL SPEED BRAKE WITH CONTROL WHEEL NEUTRAL OR FULL CONTROL WHEEL ROTATION WITH SPEED BRAKE STOWED		
INBOARD SPOILER	72° +5° −2°	39.7 +2.4 −1.0 IN	SEE NOTE 1
OUTBOARD SPOILER	60° +3° −4°	34.6 +1.50 −2.00 IN	SEE NOTE 2

30.02.27.176 A

(3) In each cylinder, retract piston rod until piston bottoms out in cylinder, adjust length of piston rod so that bolt will pass through piston rod end bearing and spoiler horn, and tighten check nut on piston rod end.

(4) Install and safety hydraulic cylinder piston rod end bearings on spoiler horns.

E. Adjust Spoiler/Speed Brake System.

NOTE: Flaps should be in "fully raised" position and hydraulic systems should be unpressurized during following adjustments.

(1) Position and secure speed brake handle 0.16 (±0.04) inch aft of stowed detent.

(2) Adjust tension of speed brake cables to 50 (±5.0) pounds at 70 degrees F (21 degrees C). Increase or decrease specified cable tension 0.25 pounds for each degree F (0.50 pounds for each degree C) increase or decrease respectively in free air temperature.

(3) Alternately loosen and tighten opposing cables until index pin 22-J107-2.0 can be inserted in aft speed brake cable quadrant on aft general controls support installation.

(4) Recheck cable tension and tighten and loosen turnbuckles in opposing cables equally until tension is within tolerance. Install NAS 651 clips in turnbuckles and free speed brake handle.

(5) Disconnect push-pull rod from aft speed brake cable quadrant arm and insert index pin 22-J107-2.0 in mixer cable quadrant.

(6) Adjust length of disconnected push-pull rod to distance between rigged cable quadrants, tighten check nut on rod end, and install free end of rod on aft speed brake cable quadrant arm.

(7) Remove index pin from aft speed brake cable quadrant.

(8) Disconnect centering spring from cam roller arm in mixer. Spring is disconnected so that swinging frame can be centered without any centering spring loads.

(9) Insert index pin 22-J107-5.0 through mixer housing and forward end of centering cam arm to secure swinging frame in centered position.

(10) Adjust tension of cables in mixer to 50 (±5.0) pounds at 70 degrees F (21 degrees C). Increase specified cable tension 0.25 pounds for each degree F (0.50 pounds for each degree C) decrease in free air temperature. Deflecting the aft mixer cable 0.25 (±0.02) inches by applying a spring scale pull of 6.9 (±0.5) pounds at a point 4.25 inches below the pivot axis of the mixer cable quadrant represents

a tension of 50 (±5.0) pounds. Cable tension is adjusted by changing the setting of the two tension adjusting arms on the mixer cable quadrant and the adjusting nut on the RH horizontal cable pulley in the mixer.

(11) Adjust length of cables in mixer by alternately loosening and tightening opposing cables until index pins 22-J107-2.0 can be inserted in both horizontal cable pulleys in mixer.

(12) Tighten check nuts on set screws in tension adjusting arms and install cotter pin in cable block on RH horizontal cable pulley.

(13) Connect centering spring disconnected in step (8).

F. Adjust Spoiler Linkage from Spoiler Aft Bell Crank to Spoiler Selector Valves.

NOTE: Airplane shall be resting on landing gear, fuel tanks shall be empty, flaps should be in "full up" position, and hydraulic systems should be unpressurized for the following adjustments. Also, check bearings in spoiler inboard idler and intermediate idler two-bearing assemblies for evidence of binding on shafts, ratcheting, or excessive wear before making final connections to these items. Replace defective bearings (refer to 27-0, Bell Crank Bearing Installation - Typical).

(1) Disconnect outboard end of spoiler control rod from spoiler aft bell crank.

(2) Insert index pin 22-J107-2.0 in spoiler aft bell crank. Insert index pin 22-J107-5.0 through mixer housing and forward end of centering cam arm to center swinging frame.

(3) Adjust length of disconnected control rod to distance between rigged bell crank and mixer input arm, tighten check nut on rod end, and install outboard end of control rod on spoiler aft cable quadrant arm.

(4) Remove rig pin from spoiler aft bell crank and check that index pins 22-J107-2.0 are installed in mixer horizontal cable pulleys.

(5) In RH wing, disconnect outboard end of control rod from spoiler interconnect idler and install index pin 22-J107-2.0 in spoiler interconnect idler.

(6) Adjust length of disconnected control rod to distance between rigged spoiler interconnect idler and spoiler inboard idler, tighten check nut on rod end, and install free end of control rod on spoiler interconnect idler. Adjust roller fairleads and pressure seal for free movement of rod.

(7) Disconnect inboard spoiler actuator from spoiler interconnect idler.

(8) Disconnect aft end of followup push-pull rod from inboard spoiler.

(9) Disconnect push-pull rod from inboard spoiler valve arm.

(10) Insert index pins 22-J107-2.0 in inboard spoiler control valve arm and inboard spoiler control valve bell crank.

(11) Adjust length of push-pull rod disconnected from valve arm to distance between rigged valve arm and bell crank, then shorten 2.5 turns, tighten check nut on rod end, and install rod on spoiler valve arm. Remove index pin from valve arm.

(12) With inboard spoiler in "retracted" position, adjust length of followup push-pull rod to distance between rigged bell crank and arm on spoiler, tighten check nut on rod end, and install aft end of rod on arm on spoiler.

(13) Check that inboard spoiler actuator is fully extended by applying 28-volt dc current across pins B and C of actuator plug. Actuator will run to extended position if not already extended.

(14) Adjust length of inboard spoiler actuator rod to distance between rigged control valve bell crank and spoiler interconnect idler, tighten check nut on rod end, and install inboard end of actuator rod on interconnect idler.

(15) Remove index pin from spoiler control valve bell crank.

(16) Disconnect control rod extending inboard and control rod extending outboard from spoiler intermediate idler.

(17) Insert index pins 22-J107-2.5 in spoiler intermediate idler and spoiler outboard idler.

(18) Adjust length of control rod extending inboard from spoiler intermediate idler to distance between rigged interconnect and intermediate idlers, tighten check nut on rod end, and install outboard end of rod on intermediate idler.

(19) Adjust length of control rod extending inboard from spoiler intermediate idler to distance between rigged intermediate and outboard idler, tighten check nut on rod end, and install inboard end of control rod on intermediate idler.

(20) Remove index pins from interconnect and intermediate idlers.

(21) Disconnect outboard spoiler actuator from spoiler outboard idler.

(22) Disconnect aft end of followup push-pull rod from outboard spoiler and push-pull rod from spoiler valve arm.

(23) Insert index pins 22-J107-2.0 through control valve arm and outboard spoiler control valve bell crank.

(24) Adjust length of push-pull rod disconnected from valve arm to distance between rigged valve arm and control valve bell crank, then shorten 0.5 turn, tighten check nut on rod end, and install free end of rod on spoiler valve arm. Remove index pin from valve arm.

(25) With outboard spoiler in "retracted" position, adjust length of followup rod to distance between rigged control valve bell crank and arm on spoiler, tighten check nut on rod end, and install rod on arm on spoiler surface.

(26) Check that outboard spoiler actuator is fully extended by applying 28-volt dc current across pins B and C of actuator plug. Actuator will run to extended position if not already extended.

(27) Adjust length of outboard spoiler actuator rod to distance between rigged spoiler outboard idler and outboard spoiler control valve bell crank, tighten check nut on rod end, and install actuator on spoiler outboard idler.

(28) Remove index pins from spoiler outboard idler and control valve bell crank.

(29) Adjust spoiler linkage in LH wing by repeating steps (5) through (28) substituting LH for RH.

(30) Remove index pins from spoiler aft bell crank, mixer housing, and mixer horizontal pulleys.

(31) Reinstall centering springs in mixer.

G. Speed Brake No-Back Adjustment.

NOTE: Normally this unit will not require adjustment except to eliminate chatter.

(1) Actuate speed brake lever fore and aft. If brake shoes do not chatter, no adjustment should be necessary.

(2) If brake shoes chatter, tighten lower set screw in aft edge of shoe carrier arm in 1/4-turn steps in CW direction.

(3) When chatter has been eliminated, back off lower aft set screw CCW as far as possible without causing chatter that is perceptible at speed brake handle.

(4) If complete readjustment of brake shoes if necessary, loosen all four screws in shoe carrier arm.

(5) Adjust both upper screws to center shoes in carrier arm with 0.040 ($\pm$0.004) inch total clearance when brake shoes are separated by small spring between them.

(6) Screw in lower forward screw to reduce holding force on cable to 100 pounds with minimum friction for unlocking motion.

(7) Check screw setting by placing spoiler horizontal levers at position corresponding to mid extension of spoilers and applying a force of 13 pounds inboard applied to aft attachment point of each lever. Check that "no back" does not slip.

(8) Similarly, screw in upper forward screw to reduce holding force on cable to 100 pounds with minimum friction for unlocking motion.

(9) Check upper screw setting by applying force of 19 pounds to spoiler horizontal levers in outboard direction.

(10) Set lower aft screw to provide gap of 0.001 inch when upper aft screw engages.

(11) Check for chatter and just barely eliminate by turning lower aft screw CW.

H. Adjust Aileron/Spoiler Autopilot Cables.

(1) Install tool No. 22-04302-16 and lock control wheels in neutral.

(2) Check that cable is centered with respect to grooves in cable drum on spoiler aft bell crank.

(3) Adjust autopilot cable tension to 105 (±10) pounds at 70 degrees F (21 degrees C). Increase or decrease cable tension 0.50 pound for each degree F (1.00 pound for each degree C) increase or decrease respectively in free air temperature. Safety turnbuckle with NAS 651 clips.

(4) Check that clockwise rotation of cable drum, as viewed from beneath, causes aileron flight tab in right wing to move upward.

(5) Secure screw and clip holding cable in drum on autopilot servo motor.

I. Adjust Aileron/Spoiler Centering Spring.

(1) Insert index pin 22-J107-5.00 through mixer housing and swinging frame.

(2) Check that centering spring roller is centered at bottom of cam detent. If so, omit steps (3) through (5).

(3) If centering spring is not centered in cam detent, disconnect centering spring, remove lock bolt from centering spring arm to allow fork end of arm to turn in hub, and loosen fork end lock nut.

(4) Adjust length of fork end of centering spring arm to center roller in cam detent.

(5) Install lock bolt in arm hub, tighten lock nut on fork end of arm, and connect centering spring.

(6) Disconnect spoiler control rod from swinging frame of mixer and spoiler override springs from spoiler horizontal arms.

(7) Remove index pin from mixer housing and swinging frame.

(8) Adjust centering spring turnbuckle so that a force of 6.25 (±0.70) pounds applied at the control rod attachment point on the swinging frame will initiate movement. Safety turnbuckle with NAS 651 clips.

(9) Install disconnected control rod on swinging frame and override springs on spoiler horizontal arms.

2. Adjustment/Test Spoiler/Speed Brake System Functional Test

A. Equipment Required.

(1) Tools No. 30-40054-901 to measure cable tension in mixer.

(2) Protractors No. 30-19053-901 and -902 (LH and RH) for measuring inboard spoiler travel, and 30-19053-903 and -904 (LH and RH) for measuring outboard spoiler travel (see Figure 204).

(3) Adapter No. 22-04302 TSTO-P for attaching spring scale to aileron control wheel, and for locking control wheel in neutral (refer to 27-1-0, Figure 204).

(4) Control wheel position indicator No. 22-04414.

(5) Spring scales calibrated from 0 to 30 pounds and from 0 to 100 pounds in 1.0 pound increments.

(6) Shop-fabricated adapter for attaching 0 to 30 pound spring scale to speed brake control handle (see Figure 205).

(7) External source of ac electrical power.

(8) External source of hydraulic power.

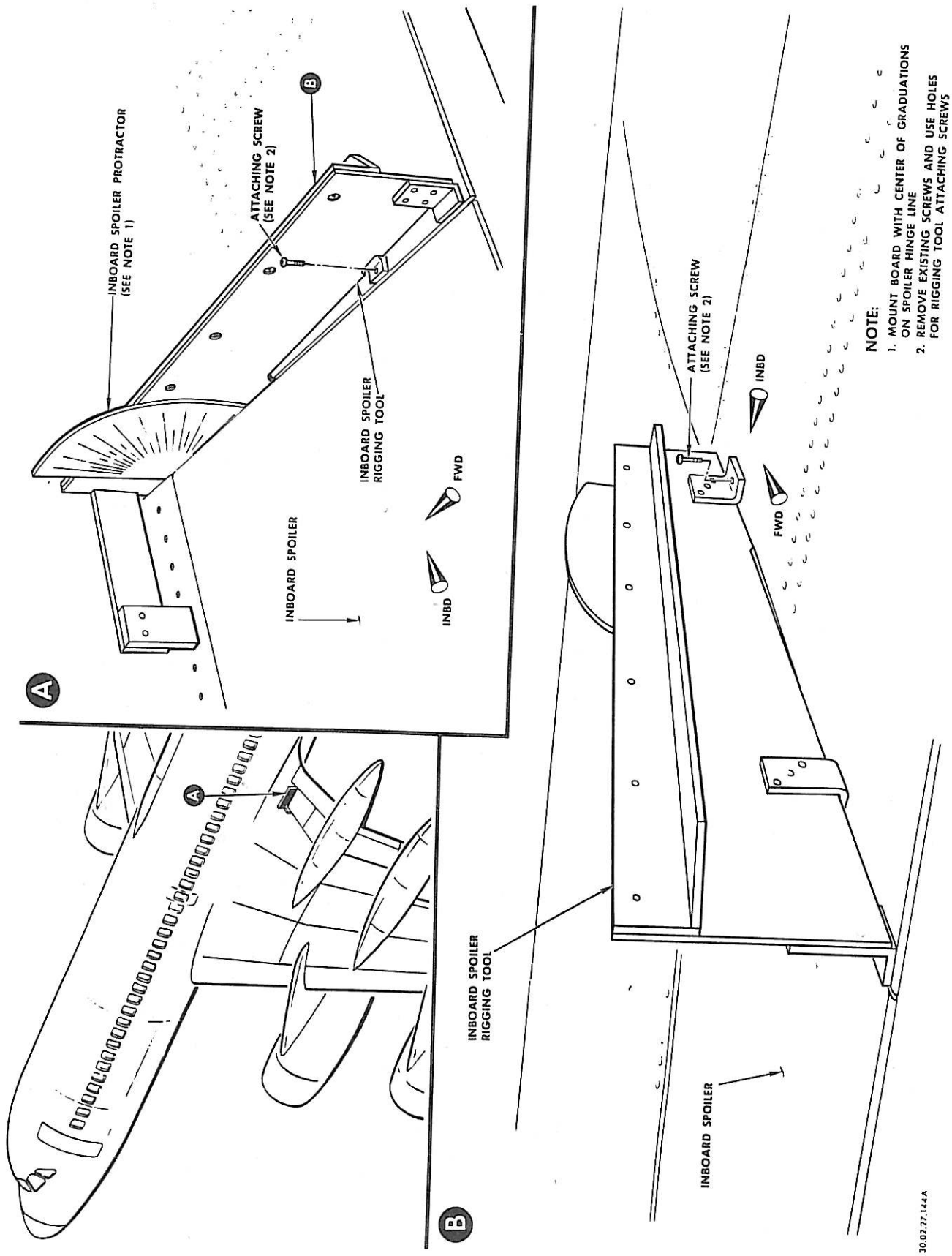
(9) Tool No. 22-43483 for locking spoiler linkage.

(10) Standard cable tensiometer.

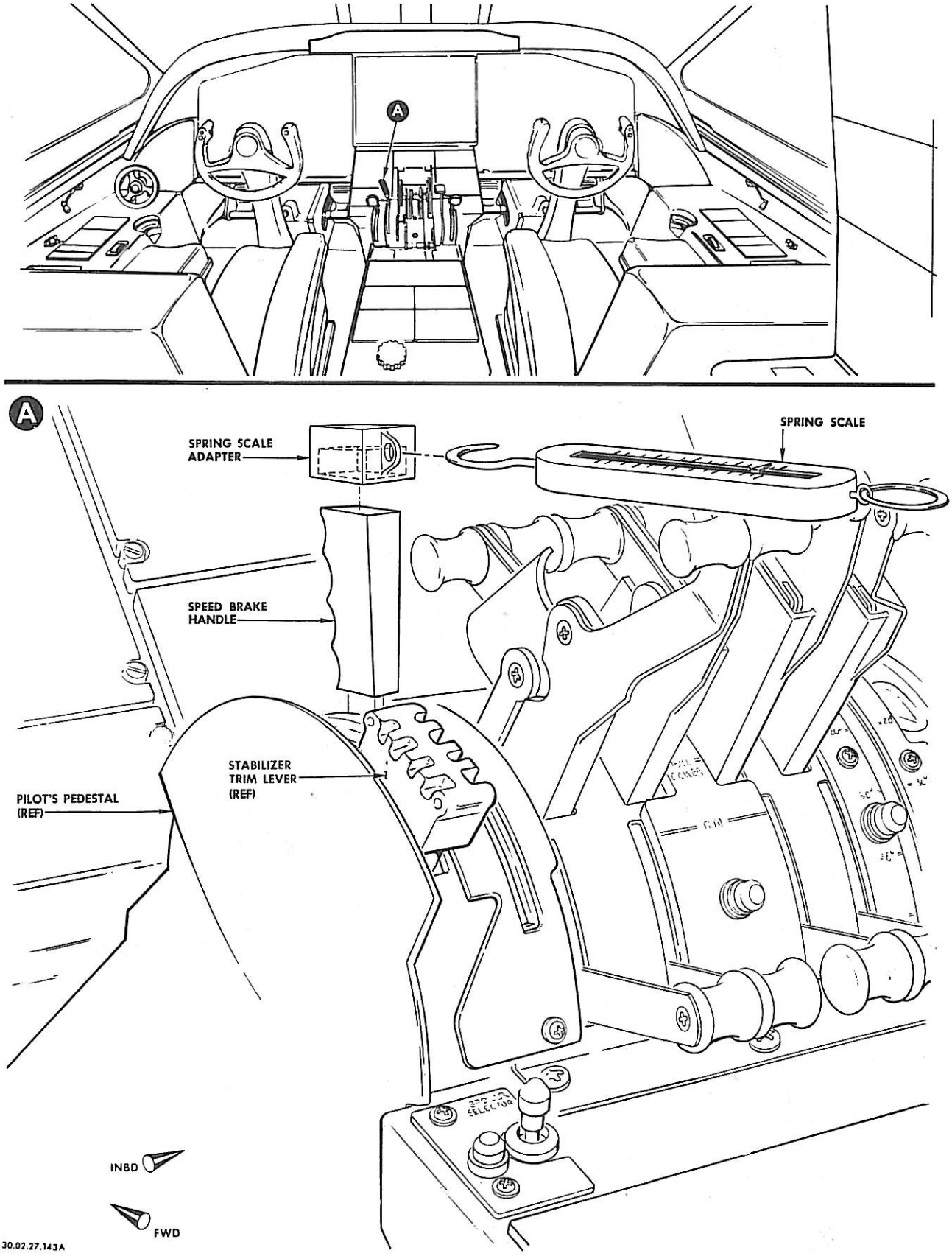
(11) Specially calibrated cable tensiometer for checking tension of 1 x 19 nonflex cable.

(12) Thermometer.

(13) Index pin No. 22-J107-2.0, or equivalent.



Inboard Spoiler Rigging Tool Installation
Figure 204


A
SPRING SCALE ADAPTER
SPRING SCALE
SPEED BRAKE HANDLE
STABILIZER TRIM LEVER (REF)
PILOT'S PEDESTAL (REF)
INBD
FWD
30.02.27.143A

B. Preoperational Check.

(1) Visually check all fairleads, pulleys, drums, quadrants, cranks, push-pull rods, cable terminals, pressure seals, turnbuckles, safety clips, cable guards, etc., for condition.

(2) Visually check spoiler and speed brake system components at all positions for proper clearance.

(3) Using specially calibrated tensiometer, check that tension of aileron/spoiler fuselage cables is 205 (±25.0) pounds at 70 degrees F (21 degrees C). Increase or decrease specified cable tension 1 pound for each degree F (2 pounds for each degree C) increase or decrease respectively in free air temperature.

(4) Using standard tensiometer, check that tension of speed brake fuselage cables is 50 (±5.0) pounds that 70 degrees F (21 degrees C). Increase or decrease specified cable tension 0.25 pound for each degree F (0.50 pound for each degree C) increase or decrease respectively in free air temperature.

(5) Remove access doors from copilot's control column, attach spring scale to turnbuckle in control column housing and check that a spring scale load of 25 (±2.0) pounds deflects turnbuckle 0.70 (+0.03, -0.35) inch. Replace access doors.

(6) Attach spring scale to speed brake aft cable in mixer 4.25 inches below speed brake cable quadrant axis and check that a spring scale force of 6.9 (±0.5) pounds is required to deflect speed brake cable 0.25 (±0.02) inch.

(7) Connect external source of ac electrical power (refer to Chapter 24, ELECTRICAL POWER).

(8) Pressurize airplane's No. 1 and No. 2 hydraulic systems (refer to Chapter 29, HYDRAULIC POWER).

(9) Actuate speed brake handle from stowed to full aft position and then back to stowed position and observe speed brake control cables, spoiler actuators, speed brake/spoiler mixer, and mechanical linkages for clearance and smooth operation while speed brakes are being operated.

(10) Check that spoilers move smoothly upward as speed brake handle is moved toward full aft position and move smoothly downward as speed brake handle is moved toward stowed position.

(11) Check that speed brake handle is in stowed position and that spoilers are flush against wing surfaces.

(12) Attach protractors to wings adjacent to inboard ends of inboard spoilers and outboard ends of outboard spoilers and adjust to read 0 degrees.

7. Test Spoiler Override Springs.

(1) Mount adapter of tool kit 22-04302 on copilot's control wheel to attach spring scale.

NOTE: Adapter 22-04302 TSTO-P for attaching spring scale to control wheel has a radius of 7 inches. If shop fabricated adapter with different radius is used, multiply the force specified in this chapter by 7 and divide the answer by the effective radius of the shop fabricated adapter to determine the correct scale force.

(2) Check that all spoilers are in "streamline" position.

(3) Using tool 22-43483, lock spoiler linkage outboard of RH spoiler override spring.

(4) Manually deflect and hold ailerons in full "right wing down" position.

(5) Using spring scale, rotate copilot's control wheel CW until stop on spoiler aft bell crank just makes contact.

(6) Check that breakout force of right spoiler override spring does not exceed 16 pounds and that force required to contact stop on spoiler aft bell crank does not exceed 95 pounds.

(7) RH and LH spoilers shall remain in streamlined position.

(8) Return copilot's control wheel to neutral position.

(9) Manually deflect and hold ailerons in full "left wing down" position.

10) Using spring scale, rotate copilot's control wheel CCW until stop on spoiler aft bell crank just makes contact.

11) Check that breakout force of right spoiler override spring does not exceed 16 pounds and that force required to contact stop on spoiler aft bell crank does not exceed 45 pounds. LH spoilers shall move to "full up" position. RH spoilers shall remain in streamline position.

12) Return copilot's control wheel to neutral position and remove tool used to lock RH spoiler control linkage.

13) Using tool 22-43483, lock spoiler linkage outboard of LH spoiler override spring.

14) Check that ailerons are deflected in full "left wing down" position.

(15) Using spring scale, rotate copilot's control wheel CCW until stop on spoiler aft bell crank just makes contact. Check that breakout force of left spoiler override spring does not exceed 16 pounds and that force required to contact stop on spoiler aft bell crank does not exceed 95 pounds. RH and LH spoilers shall remain in streamlined position.

(16) Return copilot's control wheel to neutral position.

(17) Manually deflect and hold ailerons in full "right wing down" position.

(18) Using spring scale, rotate copilot's control wheel clockwise until stop on spoiler aft bell crank just makes contact. Check that breakout force of left spoiler override spring does not exceed 16 pounds and that force required to contact stop on spoiler aft bell crank does not exceed 45 pounds. RH spoilers shall move to "full up" position. LH spoilers shall remain in streamlined position.

(19) Actuate speed brake handle to full aft position.

(20) Rotate copilot's control wheel full travel CCW and then return control wheel to neutral position.

(21) Check that speed brake no-back mechanism does not slip at any point in control wheel travel.

(22) Return copilot's control wheel to neutral position and remove tool used to lock LH spoiler linkage in neutral.

D. Test Spoiler Timing.

(1) Actuate speed brake handle quickly to full aft position.

(2) Using stop watch, check and note time required for spoilers to move from "full down" to "full up" position.

(3) Return speed brake handle to stowed position.

(4) Repeat steps (2) and (3) two more times.

(5) Check that average time for inboard spoilers to move from "full down" to "full up" position is 1.25 (±0.25) seconds.

(6) Check that average time for outboard spoilers to move from "full down" to "full up" position is 0.60 (±0.12) seconds.

(7) Actuate speed brake handle to full aft position and allow spoilers to move to "full up" position.

(8) Move speed brake handle quickly to stowed position.

(9) Using stop watch, check and note time required for spoilers to move from "full up" to "full down" position.

(10) Return speed brake handle to full aft position.

(11) Repeat steps (9) and (10) two more times.

(12) Check that average time required for inboard spoilers to move from "full up" to "full down" position is 1.25 (±0.25) seconds.

(13) Check that average time required for outboard spoilers to move from "full up" to "full down" position is 0.62 (±0.12) seconds.

E. Test Spoilers "Deadband".

NOTE: Airplane shall have no fuel aboard and be supported by landing gear during the following test.

(1) Check that control wheels are in neutral, that spoilers are streamline with wings, and that hydraulic systems are pressurized.

(2) Install control wheel position indicator No. 22-04414 on copilot's control wheel.

(3) Using a sharp soft pencil, draw a reference inverted "V" in notch provided at centerline of control wheel position indicator.

(4) Slowly rotate copilot's control wheel CW until tip of reference inverted "V" is visible in RH 15° slot in position indicator.

(5) Hold control wheel in this position and check that RH inboard spoiler has raised 2.68 (±0.45) inches and that RH outboard spoiler has raised 3.0 (±0.49) inches.

NOTE: Spoiler travel is measured from the streamlined position of the inboard ends of the inboard spoilers and from the streamlined position of the outboard ends of the outboard spoilers.

(6) Rotate copilot's control wheel CCW until tip of reference inverted "V" is visible in LH 15° slot in position indicator.

(7) Hold control wheel in this position and check that LH inboard spoiler has raised 2.68 (±0.45) inches and that LH outboard spoiler has raised 3.0 (±0.49) inches.

(8) Remove position indicator from copilot's control wheel and erase pencil mark from control column.

F. Test Spoiler System Operation Using No. 1 Hydraulic System.

(1) Depressurize No. 2 hydraulic system (refer to Chapter 12, SERVICING) and check that No. 1 hydraulic system is pressurized to 3000 (±100) psig.

(2) Conduct spoiler/speed brake tests set forth in Table I.

TABLE I

SPOILER DEFLECTION CHECKS

TEST NO.	CONTROL WHEEL POSITION	SPEED BRAKE HANDLE POSITION	SPOILER POSITIONS *			
			LH OUTBOARD	LH INBOARD	RH INBOARD	RH OUTBOARD
1.	NEUTRAL	STOWED	STREAMLINE	STREAMLINE	STREAMLINE	STREAMLINE
2.	FULL CLOCKWISE	STOWED	STREAMLINE	STREAMLINE	UP 72° +5° -2°	UP 60° +3° -4°
3.	FULL COUNTER-CLOCKWISE	STOWED	UP 60° +3° -4°	UP 72° +5° -2°	STREAMLINE	STREAMLINE
4.	NEUTRAL	FULL AFT TRAVEL	UP 60° +3° -4°	UP 72° +5° -2°	UP 72° +5° -2°	UP 60° +3° -4°
5.	FULL CLOCKWISE	FULL AFT TRAVEL	STREAMLINE +0.5° **	STREAMLINE	UP 72° +5° -2°	UP 60° +3° -4°
6.	FULL COUNTER-CLOCKWISE	FULL AFT TRAVEL	UP 60° +3° -4°	UP 72° +5° -2°	STREAMLINE	STREAMLINE + 0.5° **

NOTES: *(1) When checking spoiler throws, manually deflect ailerons to a "right wing down" position when moving control wheel clockwise. Manually deflect ailerons in a "left wing down" position when moving control wheel counterclockwise.

**(2) As measured at the inboard corner of the spoiler trailing edge.

(3) When all tests in Table I are satisfactory, return speed brake handle to stowed position and allow spoilers to return to "streamline" position.

G. Test Spoiler System Operation Using No. 2 Hydraulic System.

(1) Pressurize No. 2 hydraulic system (refer to Chapter 29, HYDRAULIC POWER). Bleed spoiler system (refer to Adjustment/Test Spoiler Control System Bleeding Procedure).

(2) Depressurize No. 1 hydraulic system (refer to Chapter 12, SERVICING).

(3) Actuate speed brake handle to full aft position and check that outboard spoilers move smoothly up to 60 (+3, -4) degrees and that inboard spoilers move up smoothly to 72 (+5, -2) degrees.

(4) Return speed brake handle to stowed position and check that all spoilers return smoothly to "streamline" position.

(5) Pressurize No. 1 hydraulic system (refer to Chapter 29, HYDRAULIC POWER). Bleed spoiler system (refer to Adjustment/Test Spoiler Control System Bleeding Procedure).

H. Test Speed Brake Handle Operation.

(1) Attach 0 to 30 pound spring scale and shop-fabricated adapter to uppermost point of speed brake handle.

(2) Using spring scale, pull speed brake handle full travel aft and check that breakout force does not exceed 8 pounds and that force required to move speed brake handle full aft does not exceed 22 pounds. Note actual force required to move handle full aft.

(3) Check that all spoilers move smoothly to "full up" position.

(4) Using spring scale, return speed brake handle to stowed position, check that all spoilers move to "streamline" position, and check that force required does not exceed force noted in step (2).

(5) Remove spring scale and adapter from speed brake handle.

(6) Pull speed brake handle full aft and then return handle toward stowed position until speed brake stops in mixer just make contact.

(7) Check that speed brake handle is 0.16 ($\pm$0.04) inch from stowed detent when speed brake stops just make contact.

I. Test Inboard and Outboard Spoiler Retract Operation.

(1) Connect external source of electrical power to airplane (refer to Chapter 24, ELECTRICAL POWER).

(2) Close SPOILER DE-ACTIVATION, INBD AND OUTBD, circuit breakers on main circuit breaker panel and check that SPOILER SELECTOR switch on pilots' pedestal is positioned on NORM.

(3) Check that all power levers are in IDLE position.

(4) Check that all landing gear units are down and locked and that landing gear ground safety switches are in "groundborne" position.

(5) Close FLAP ASYM CONT circuit breaker on main circuit breaker panel and check that FLAP PWR SEL switch is positioned on NORMAL #1.

(6) Actuate flap control lever to 27° detent and allow flaps to move to position selected.

(7) Using stabilizer control levers, position stabilizer at 4 (±1.0) degrees airplane "nose up".

(8) Actuate speed brake handle to full aft travel position and check that all spoilers move to "full up" position.

(9) Check inboard and outboard spoiler deactivation operations as set forth in Table II.

CAUTION: MAXIMUM OPERATING DUTY CYCLE OF EACH SPOILER RETRACT ACTUATOR IS 10 SECONDS ON, FOLLOWED BY 5 MINUTES OFF.

(10) Open INBD SPOILER DE-ACTIVATION circuit breaker. Actuate SPOILER SELECTOR switch to NOSE DN position and check that outboard spoilers move down (refer to step (5) in Table II). Return SPOILER SELECTOR switch to NORM position and check that outboard spoilers move to "full up" position.

(11) Close INBD SPOILER DE-ACTIVATION circuit breaker and open OUTBD SPOILER DE-ACTIVATION circuit breaker.

(12) Actuate SPOILER SELECTOR switch to NOSE UP position and check that inboard spoilers move down (refer to step (2) in Table II). Return SPOILER SELECTOR switch to NORM position and check that inboard spoilers move to "full up" position.

(13) Close OUTBD SPOILER DE-ACTIVATION circuit breaker.

(14) When all tests in Table II are satisfactory, return speed brake handle to stowed position and allow all spoilers to return to "streamline" position.

J. Test Spoiler Warning Horn Operation.

(1) Check that all power levers are in IDLE position and that landing gear ground safety switch is in "groundborne" position.

(2) Close WARN HORN and LG HANDLE SOL circuit breakers on main circuit breaker panel.

TABLE II

SPOILER DEACTIVATION CHECKS

TEST NO.	SPOILER DEACT. SWITCH	CONTROL WHEEL POSITION	SPOILER POSITION			
			LH OUTBOARD	LH INBOARD	RH INBOARD	RH OUTBOARD
1.	NORMAL	NEUTRAL	FULL UP	FULL UP	FULL UP	FULL UP
2.	NOSE UP	NEUTRAL	FULL UP	STREAMLINE	STREAMLINE	FULL UP
3.	NOSE UP	FULL CW	STREAMLINE * TO 0.5" UP	STREAMLINE	STREAMLINE TO 5° UP	FULL UP
4.	NOSE UP	FULL CCW	FULL UP	STREAMLINE TO 5° UP	STREAMLINE	STREAMLINE * TO 0.5" UP
5.	NOSE DN	NEUTRAL	STREAMLINE * TO 0.5" UP	FULL UP	FULL UP	STREAMLINE * TO 0.5" UP
6.	NOSE DN	FULL CW	STREAMLINE * TO 0.5" UP	STREAMLINE	FULL UP	STREAMLINE TO 5° UP
7.	NOSE DN	FULL CCW	STREAMLINE TO 5° UP	FULL UP	STREAMLINE	STREAMLINE * TO 0.5" UP
8.	NORMAL	NEUTRAL	FULL UP	FULL UP	FULL UP	FULL UP

NOTE: *As measured at the inboard corner of the spoiler trailing edge.

(3) Actuate speed brake handle to full aft position and allow spoilers to move to "full up" position.

(4) Advance power levers No. 1 and 2 to TAKE OFF position and check that warning horn sounds "1 second on - 1 second off".

(5) Return speed brake handle slowly to stowed position and check that warning horn stops sounding between streamlined to 1.0 degree position of spoilers and stowed position of speed brake handle.

(6) Return power levers to IDLE position.

(7) Continue with tests set forth in Table III.

(8) Depressurize No. 1 and No. 2 hydraulic systems (refer to Chapter 12, SERVICING).

K. Test Spoiler Control System Friction.

NOTE: Both hydraulic systems should be depressurized for this test.

(1) Place control column in neutral position and insert index pin 22-J107-2.0 in elevator RH forward "T" bell crank.

(2) Install control wheel position indicator No. 22-04414 on control wheel.

(3) Attach adapter No. 22-04302 to horn on aileron control wheel.

(4) Manually position ailerons in the right wing down condition (right aileron full up).

NOTE: When performing the procedure in the following steps, convert the indications on the spring scale to equivalent inch-pounds of torque by measuring the distance from the center of the control wheel hub to the point on the adapter where the spring scale attaches. Multiply this figure by the pounds of force indicated on the scale to obtain inch-pounds.

(5) Attach spring scale to adapter on control wheel, and slowly pull wheel in a clockwise direction with scale until wheel is approximately 60 degrees from neutral (0 degree) position. While control wheel is rotating, record torque required to rotate wheel 10 degrees, 35 degrees, and 50 degrees from 0 degree position. Torque required to rotate wheel 10 degrees shall be less than 97 inch-pounds, less than 163 inch-pounds to rotate wheel 35 degrees, and less than 229 inch-pounds to rotate wheel 50 degrees.

TABLE III

SPOILER WARN CHECKS

TEST NO.	POWER LEVER POSITIONS	EMER PITCH SWITCH	SPEED BRAKE CONT HANDLE POSITION	LH LG GND SAFETY SWITCH	WARN HORN
1.	ALL RETARDED	NORMAL	STOWED	GND	SILENT
2.	ALL RETARDED	NORMAL	FULL AFT	GND	SILENT
3.	ANY TWO POWER LEVERS AT TAKE-OFF	NORMAL	FULL AFT	GND	SOUNDS 1 SECOND ON & 1 SECOND OFF
4.	ANY TWO POWER LEVERS AT TAKE-OFF	PITCH UP	FULL AFT	GND	SOUNDS 1 SECOND ON & 1 SECOND OFF
5.	ANY TWO POWER LEVERS AT TAKE-OFF	PITCH DN	FULL AFT	GND	SOUNDS 1 SECOND ON & 1 SECOND OFF
6.	ALL POWER LEVERS AT TAKE-OFF	NORMAL	STOWED	GND	SILENT
7.	ANY TWO POWER LEVERS AT TAKE-OFF	PITCH UP	STOWED	GND	SOUNDS 1 SECOND ON & 1 SECOND OFF
8.	ANY TWO POWER LEVERS AT TAKE-OFF	PITCH DN	STOWED	GND	SOUNDS 1 SECOND ON & 1 SECOND OFF
9.	ALL POWER LEVERS AT TAKE-OFF	NORMAL	STOWED	AIR	SILENT
10.	ALL POWER LEVERS RETARDED	NORMAL	FULL AFT	AIR	SILENT
11.	ANY TWO POWER LEVERS AT TAKE-OFF	NORMAL	FULL AFT	AIR	SOUNDS 1 SECOND ON & 1 SECOND OFF
12.	ANY TWO POWER LEVERS AT TAKE-OFF	PITCH UP	FULL AFT	AIR	SILENT
13.	ANY TWO POWER LEVER AT TAKE-OFF	PITCH DN	FULL AFT	AIR	SILENT

NOTE: Airborne configuration of LH LG GND SAFETY switch (4th column, TESTS NO. 9, 10, 11, 12, and 13) can be simulated by opening LH LANDING GEAR GRD SAFETY RELAYS circuit breaker on main circuit breaker panel.

(6) While restraining control wheel with spring scale, allow wheel to slowly return to neutral position. Record torque required to restrain wheel at 50 degree, 35 degree, and 10 degree positions. Torque indications, recorded while wheel is rotating, shall be greater than 62.5, 44.0, and 10.5 inch-pounds at 10.5 inch-pounds at the 50, 35, and 10 degree position, respectively.

(7) Compare torque values recorded in step (5) with torque values recorded in step (6). The differences between torque values shall not be greater than 70, 107.5 and 128.5 inch-pounds at the 10, 35 and 50 degree positions, respectively.

(8) Repeat steps (4) through (7) except start with ailerons in the left wing down condition (left aileron full up) and substitute counterclockwise for clockwise in step (5).

(9) When tests are satisfactory streamline ailerons, remove position indicator and adapter from control wheel, and remove index pin from elevator RH forward "T" bell crank.

L. Conclusion.

When all tests are satisfactory remove all test equipment and return airplane to normal configuration.

3. Adjustment/Test Spoiler Control System Bleeding Procedure

A. General.

After breaking into or replacing a component of the spoiler control hydraulic system, the system must be bled to remove any entrapped air.

B. Equipment Required.

(1) External source of ac electrical power.

(2) External source of hydraulic power.

C. Bleed Spoiler System.

(1) Examine area of component travel for tools, equipment, or other materials which could obstruct travel. Remove any obstructions found.

(2) Connect source of external electrical power (refer to Chapter 24, ELECTRICAL POWER).

(3) Pressurize No. 1 and No. 2 hydraulic systems (refer to Chapter 29, HYDRAULIC POWER).

(4) Rotate pilot's control wheel clockwise until aileron flight tab stops make contact.

(5) Rotate pilot's control wheel counterclockwise until aileron flight tab stops make contact.

(6) Repeat steps (4) and (5) 24 times, to completely bleed system.

(7) When cycling procedure is completed, depressurize hydraulic systems and service if necessary (refer to Chapter 12, SERVICING).

(8) Return airplane to its normal configuration.

INBOARD SPOILERS - MAINTENANCE PRACTICES

1. Removal/Installation - Inboard Spoilers (see Figure 201)

A. General.

Each inboard spoiler consists of two sections joined by expansion fingers.

B. Equipment Required.

(1) External source of electrical power.

(2) External source of hydraulic power.

(3) Index pin No. 22-J107-2.0.

(4) Graphite grease, Specification MIL-G-7187.

(5) Shop-fabricated spacer block.

C. Remove Inboard Spoiler.

(1) Connect external source of electrical power to airplane and close FLAP ASYM CONT circuit breaker on main circuit breaker panel (refer to Chapter 24, ELECTRICAL POWER).

(2) Check that FLAP PWR SELECT switch is positioned on NORMAL # 1 and that flap control lever setting corresponds roughly with position of flaps.

(3) Connect external source of hydraulic power to airplane and pressurize No. 1 and 2 hydraulic systems (refer to Chapter 29, HYDRAULIC POWER).

CAUTION: DO NOT OPERATE FLAPS UNLESS BOTH HYDRAULIC SYSTEMS ARE PRESSURIZED, ELECTRICAL POWER IS APPLIED TO THE AIRPLANE, THE "FLAP ASYM CONT" CIRCUIT BREAKER IS CLOSED, AND THE "FLAP PWR SELECT" SWITCH IS POSITIONED ON "NORMAL # 1".

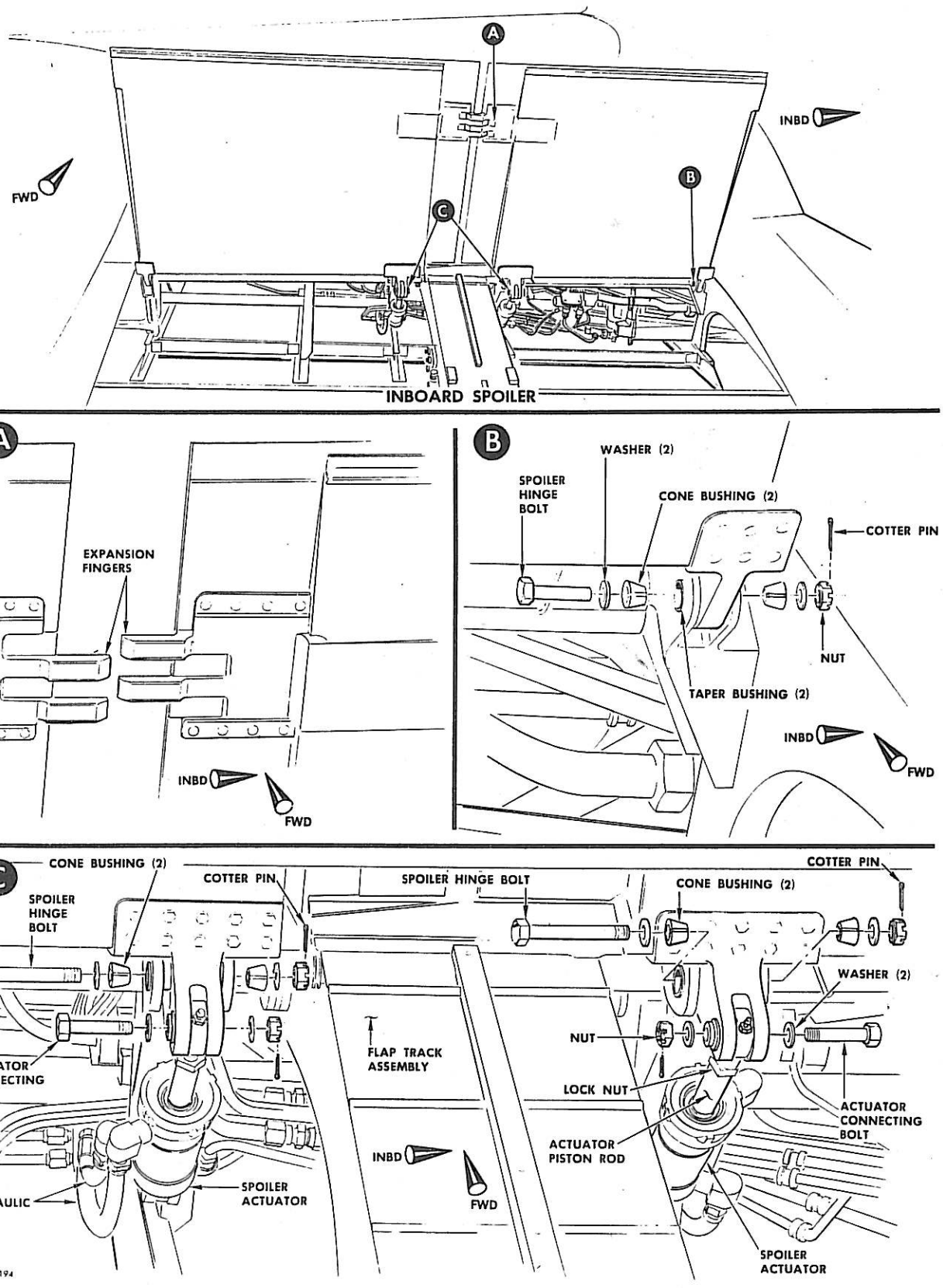
(4) Actuate flap control lever to DOWN detent and lower flaps.

(5) Depressurize hydraulic systems (refer to Chapter 12, SERVICING).

(6) Open two access doors in under surface of wing in line with spoiler to be removed.

(7) Detach bonding jumpers from spoiler sections.

(8) Disconnect followup push-pull rod from extension on inboard actuator connecting bolt.



Inboard Spoiler Installation
Figure 201

(9) Remove bolts connecting spoiler actuators to fittings on spoiler sections.

(10) Remove bolts and cone bushings at two hinge points on each spoiler section and remove spoiler.

D. Install Inboard Spoiler.

(1) Apply light coat of graphite grease, Specification MIL-G-7178, on outside surface of cone bushings and insert cone bushings in four spoiler hinge fittings on wing structure.

NOTE: Do not allow graphite grease to come in contact with inside surface of cone bushings.

(2) Engage expansion fingers to align spoiler sections, position spoiler bearings in hinge fittings, and insert four hinge bolts. Check that gap between each cone bushing and hinge bearing at each hinge point does not exceed 0.005 inch.

(3) Using spacer block to support hinge fitting, tighten each hinge bolt and draw cone bushings against bearing. Loosen hinge bolt nut, remove spacer block, tighten nut, and secure with cotter pin.

(4) Attach bonding jumpers to leading edge of spoiler sections.

(5) Check that spoiler is in full down position, retract each actuator until piston bottoms out in cylinder, and adjust length of actuator piston rod as necessary to align bolt holes in actuator fitting with bolt hole in actuator rod end bearing.

(6) Install bolts attaching actuators to actuator fittings, tighten check nut on actuator piston rod, and secure with locking key and safety wire.

NOTE: An extension on the inboard end of the inboard actuator upper connecting bolt serves as an attachment for the spoiler control mechanism followup rod.

(7) Insert index pin No. 22-J107-2.0 in inboard spoiler control mechanism and check that spoiler is in full down position.

(8) Adjust length of followup push-pull rod as necessary to align hole in rod end bearing with extension on inboard actuator connecting bolt, install rod on bolt extension, and tighten check nut on rod end.

(9) Remove index pin from spoiler control mechanism and test spoiler system (refer to 27-3-0, Adjustment/Test - Spoiler/Speed Brake System Functional Test).

NOTE: If an inboard spoiler only has been replaced and no other rigging or adjustment has been changed, check spoiler operation per 27-3-0, TABLE I, SPOILER DEFLECTION CHECKS.

OUTBOARD SPOILERS - MAINTENANCE PRACTICES

1. Removal/Installation - Outboard Spoilers (see Figure 201)

A. General.

Each outboard spoiler is made up of three sections joined by expansion fingers. The outboard section extends outboard beyond the outboard flap and fits into a recess in the upper surface of the wing. The inboard section is mounted at three hinge points and is positioned by two actuators. The center and outboard sections are mounted at two hinge points and each section is positioned by one actuator. The outboard actuator is accessible through an access panel in the under surface of the wing.

B. Equipment Required.

(1) External source of electrical power.

(2) External source of hydraulic power.

(3) Index pin No. 22-J107-2.0.

(4) Shop-fabricated spacer block to support hinge fittings.

(5) Graphite grease, Specification MIL-G-7187.

C. Remove Outboard Spoiler.

(1) Connect external source of electrical power to airplane and close FLAP ASYM CONT circuit breaker on main circuit breaker panel (refer to Chapter 24, ELECTRICAL POWER).

(2) Check that FLAP PWR SELECT switch is positioned on NORMAL # 1 and that flap control lever setting corresponds roughly with position of flaps.

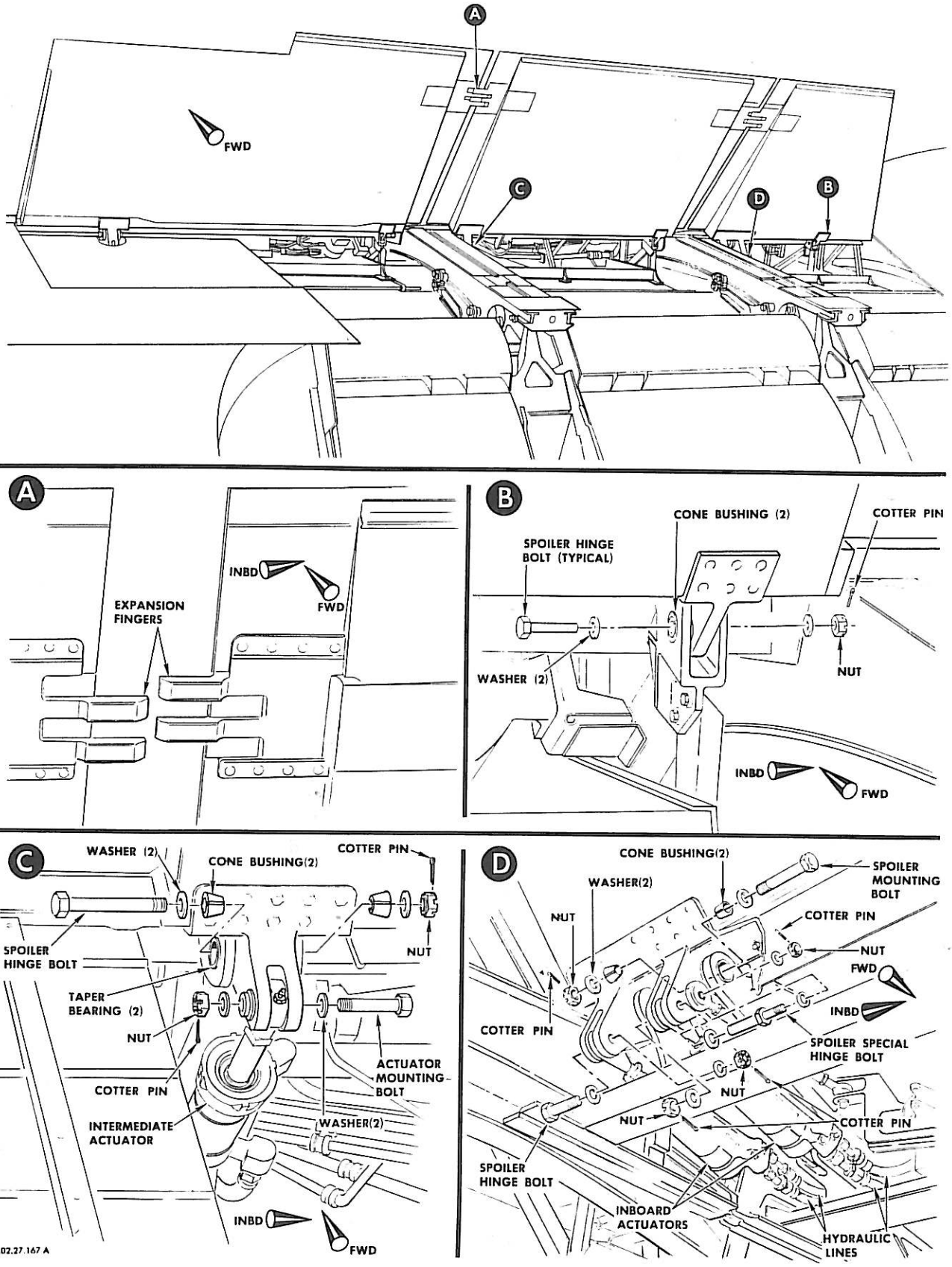
(3) Connect external source of hydraulic power and pressurize No. 1 and No. 2 hydraulic systems (refer to Chapter 29, HYDRAULIC POWER).

CAUTION: DO NOT OPERATE FLAPS UNLESS BOTH HYDRAULIC SYSTEMS ARE PRESSURIZED, ELECTRICAL POWER IS APPLIED TO THE AIRPLANE, THE "FLAP ASYM CONT" CIRCUIT BREAKER IS CLOSED, AND THE "FLAP PWR SELECT" SWITCH IS POSITION ON "NORMAL # 1".

(4) Actuate flap control lever to DOWN detent and lower flaps.

(5) Depressurize hydraulic systems (refer to Chapter 12, SERVICING).

(6) Open two access doors in under surface of wing in line with spoiler being removed and remove one access panel in under surface of wing in line with outobard section of spoiler.



Outboard Spoiler Installation
Figure 201

(7) Detach bonding jumpers from spoiler sections.

(8) Disconnect followup push-pull rod from extension on inboard actuator upper connecting bolt.

(9) Remove bolts connecting spoiler actuators to fittings on spoiler sections.

(10) Remove hinge bolts and cone bushings at seven hinge points and remove spoiler from airplane.

D. Install Outboard Spoiler.

(1) Apply light coat of graphite grease, Specification MIL-G-7187, on outside surface of cone bushings and insert cone bushings in seven spoiler hinge fittings on wing structure.

NOTE: Do not allow graphite grease to come in contact with inside surface of cone bushings.

(2) Engage expansion fingers to align spoiler sections, position spoiler bearings in hinge fittings, and insert seven hinge bolts. Check that gap between each cone bushing and hinge bearing at each hinge point does not exceed 0.005 inch.

(3) Using spacer block to support hinge fitting, tighten each hinge bolt and draw cone bushings against bearing. Loosen hinge bolt nut, remove spacer block, tighten nut, and secure with cotter pin.

(4) Attach bonding jumpers to leading edge of spoiler sections.

(5) Check that spoiler is in "full down" position, retract each actuator until piston bottoms out in cylinder, and adjust length of actuator piston rod as necessary to align bolt holes in actuator fitting with bolt hole in actuator rod end bearing.

(6) Install bolts attaching actuators to actuator fittings, tighten check nut on actuator piston rod, and secure with locking key and safety wire.

NOTE: An extension on the inboard end of the inboard actuator upper connecting bolt serves as an attachment for the spoiler control mechanism followup rod.

(7) Insert index pin 22-J107-2.0 in outboard spoiler control mechanism and check that spoiler is in "full down" position.

(8) Adjust length of followup push-pull rod as necessary to align hole in rod end bearing with extension on inboard actuator upper connecting bolt, install rod on bolt extension, and tighten check nut on rod end.

(9) Remove index pin from spoiler control mechanism and test spoiler system (refer to 27-3-0, Adjustment/Test - Spoiler/Speed Brake System Functional Test).

NOTE: If an outboard spoiler only has been replaced and no other rigging or adjustment has been changed, check spoiler operation per 27-3-0, TABLE I, SPOILER DEFLECTION CHECKS.

SPOILER ACTUATORS - MAINTENANCE PRACTICES

1. Removal/Installation Spoiler Actuators (see Figure 201)

A. Installation and removal procedure for all 12 spoiler actuators are identical with the exception that the upper connecting bolt of the inboard actuator on all 4 spoilers has an extension on the head end of the bolt for attaching the spoiler control mechanism followup push-pull rod.

B. Equipment Required.

(1) External source of electrical power.

(2) External source of hydraulic power.

(3) Receptacle for draining hydraulic lines.

C. Remove Spoiler Actuator.

(1) Connect external source of electrical power and close FLAP ASYM CONT circuit breaker on main circuit breaker panel (refer to Chapter 24, ELECTRICAL POWER).

(2) Check that FLAP PWR SELECT switch is positioned on NORMAL # 1 and that flap control lever setting corresponds roughly with position of flaps.

(3) Connect external source of hydraulic power and pressurize No. 1 and No. 2 hydraulic systems (refer to Chapter 29, HYDRAULIC POWER).

CAUTION: DO NOT OPERATE FLAPS UNLESS BOTH HYDRAULIC SYSTEMS ARE PRESSURIZED, ELECTRICAL POWER IS APPLIED TO THE AIRPLANE, THE "FLAP ASYM CONT" CIRCUIT BREAKER IS CLOSED, AND THE "FLAP PWR SELECT" SWITCH IS POSITIONED ON "NORMAL # 1".

(4) Actuate flap control lever to DOWN detent and lower flaps.

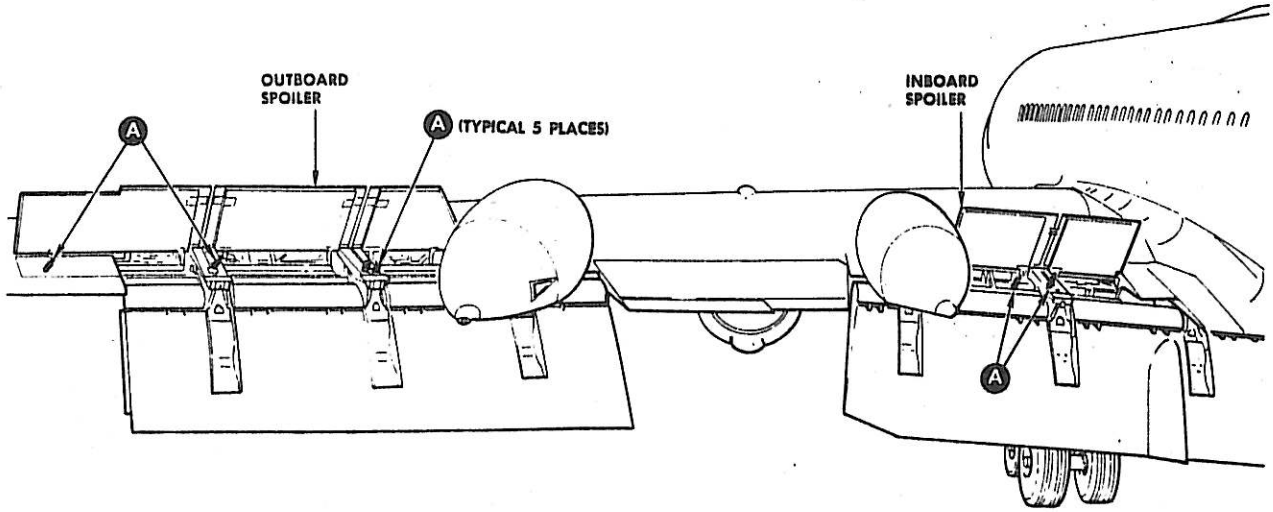
(5) Depressurize hydraulic systems (refer to Chapter 12, SERVICING).

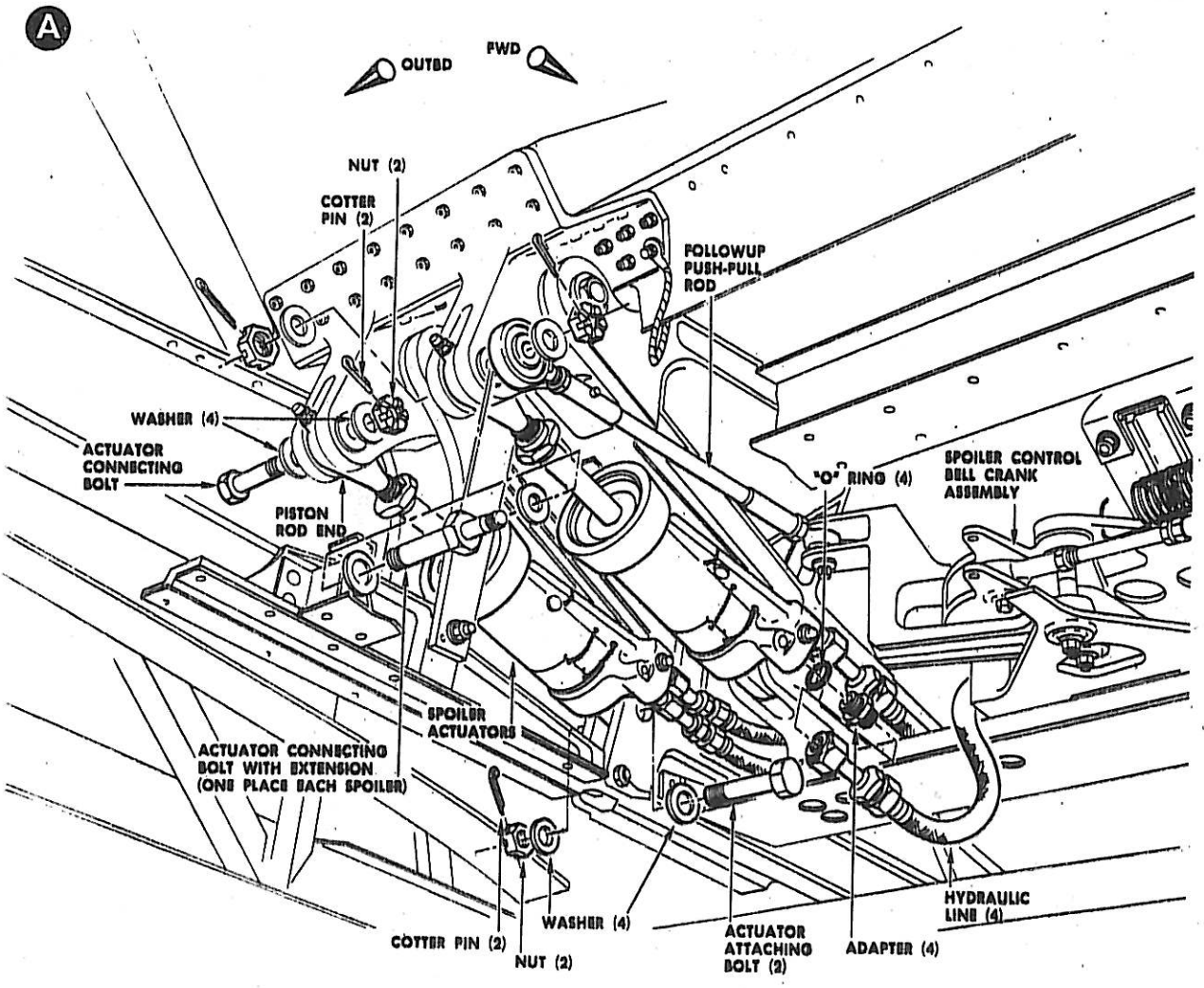
(6) Disconnect two hydraulic lines from actuator being removed and drain lines into receptacle.

(7) Disconnect actuator piston rod end from actuator fitting on spoiler.

NOTE: If inboard actuator of any spoiler is being removed, remove nut and detach spoiler control mechanism push-pull rod from actuator connecting bolt extension.

(8) Disconnect lower end of actuator from actuator fitting on wing structure and remove actuator.





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Spoiler Actuator Installation
Figure 201

D. Install Spoiler Actuator.

(1) Position spoiler actuator and install bolt attaching lower end of actuator to fitting on wing structure.

(2) Connect hydraulic lines to actuators.

(3) Check that spoiler is in "full down" position and adjust length of actuator piston rod so that hole in actuator rod end is aligned with holes in actuator fitting on spoiler when actuator piston is bottomed out in lower end of cylinder.

(4) Tighten check nut on actuator piston rod and safety with locking key and safety wire.

(5) Install bolt attaching actuator piston rod to actuator fitting on spoiler.

(6) If the inboard actuator on any spoiler is being installed, the connecting bolt must be installed with the extension on the bolt head pointed inboard.

NOTE: The connecting bolt of the inboard actuator on any spoiler must be installed with the bolt head extension pointed inboard.

(7) If installing an inboard actuator, insert index pin 22-J107-2.0 in spoiler control mechanism bell crank, check that spoiler is in "full down" position, adjust length of followup push-pull rod to align hole in rod end with actuator connecting bolt head extension, and install rod end on bolt extension.

(8) Remove index pin from control mechanism bell crank and bleed spoiler hydraulic system (refer to 27-3-0, Adjustment/Test - Spoiler Control System Bleeding Procedure).

(9) Check spoiler operation (refer to 27-3-0, Adjustment/Test Spoiler/Speed Brake Functional Test).

NOTE: If a spoiler actuator only has been replaced and no other rigging or adjustment has been changed, check spoiler operation per 27-3-0, TABLE I, SPOILER DEFLECTION CHECKS.

INBOARD SPOILER CONTROL MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation - Inboard Spoiler Control Bell Crank Assembly (see Figure 201)

   A. Equipment Required.

      (1) Three index pins No. 22-J107-2.0.

   B. Remove Inboard Spoiler Control Bell Crank Assembly.

      (1) Open access door in under surface of wing between inboard and center inboard flap tracks.

      (2) Disconnect spoiler selector valve arm push-pull rod from spoiler control bell crank and valve spring.

      (3) Disconnect inboard spoiler retract actuator push-pull rod from forward arm of spoiler control bell crank.

      (4) Disconnect forward end of followup push-pull rod from outboard arm of spoiler control bell crank.

      (5) Remove four bolts attaching spoiler selector valve to mounting pad on bell crank assembly and separate control valve from pad.

      (6) Remove four mounting bolts attaching bell crank assembly to structure and remove bell crank assembly.

   C. Install Inboard Spoiler Control Bell Crank Assembly.

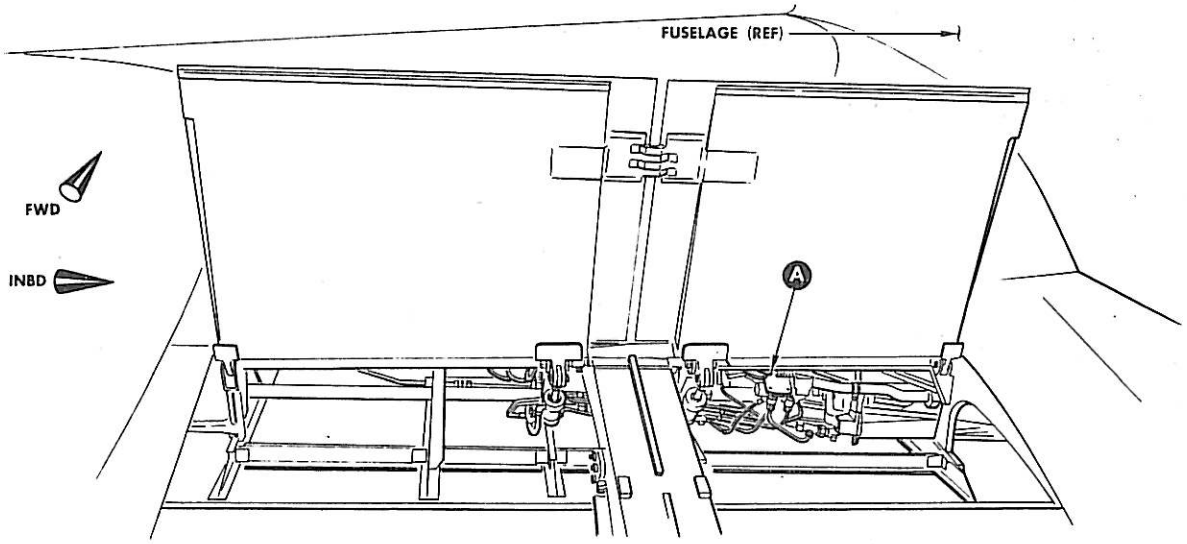
      (1) Position inboard spoiler bell crank assembly and install four mounting bolts.

      (2) Position spoiler selector valve on valve pad and install four mounting bolts.

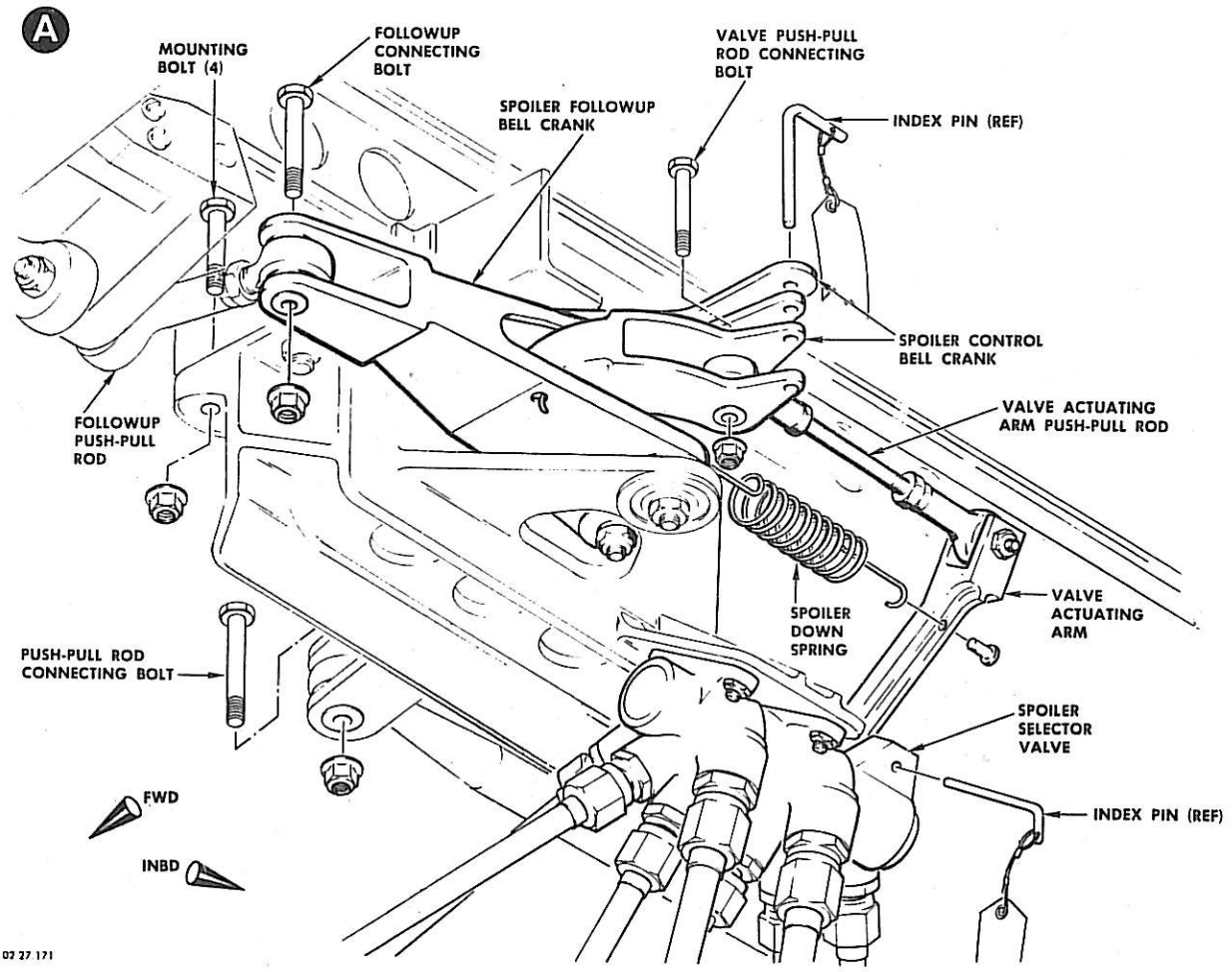
      (3) Insert index pins 22-J107-2.0 in spoiler interconnect bell crank, in spoiler control bell crank, and in spoiler selector valve arm.

      (4) Check that inboard spoiler retract actuator is in the electrically extended position by applying 28 volts dc across pins B and C of actuator electrical receptacle. If not fully extended, actuator will run to extended position.

      (5) Adjust length of actuator push-pull rod as necessary to distance between rigged interconnect bell crank and rigged forward arm of spoiler control bell crank, install outboard end of actuator push-pull rod on forward arm of spoiler control bell crank, and tighten check nut on rod end.



INBOARD SPOILER



Inboard Spoiler Control Bell Crank
Assembly Installation
Figure 201

(6) Check that spoiler is in "full down" position and adjust length of followup push-pull rod as necessary to distance between extension on spoiler actuator connecting bolt and rigged spoiler control outboard bell crank.

(7) Connect followup push-pull rod to control bell crank outboard arm and tighten check nut on rod end.

(8) Adjust length of selector valve push-pull rod as necessary to align hole in push-pull rod end with holes in aft arm of control valve bell crank, shorten push-pull rod 2 1/2 turns, remove index pin from selector valve arm, connect selector valve push-pull rod to bell crank arm, and tighten check nut on rod end.

(9) Install valve arm return spring and remove index pins from interconnect bell crank and spoiler control bell crank.

(10) Test spoiler system (refer to 27-3-0, Adjustment/Test - Spoiler/ Speed Brake System Functional Test).

NOTE: If an inboard spoiler control bell crank assembly only has been replaced and no other rigging or adjustment has been changed, check spoiler operation per 27-3-0, TABLE I, SPOILER DEFLECTION CHECKS and paragraphs 2.D. and 2.E.

2. Removal/Installation - Inboard Spoiler Selector Valve (see Figure 202)

A. Equipment Required.

(1) Two index pins No. 22-J107-2.0.

(2) Receptacle to drain disconnected hydraulic lines.

B. Remove Inboard Spoiler Selector Valve.

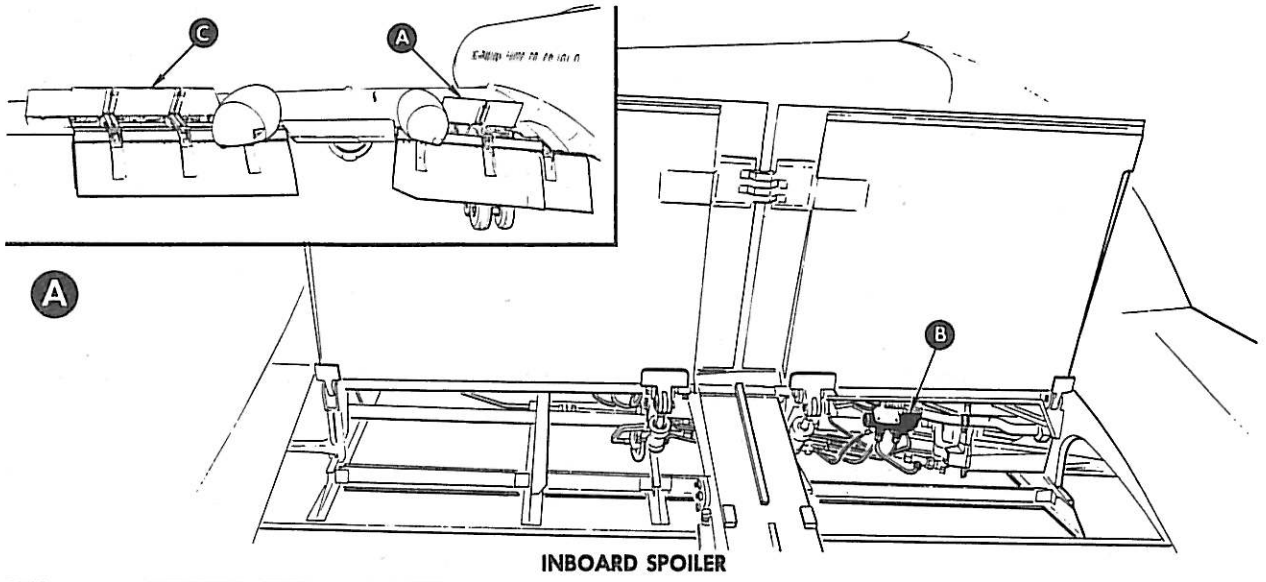
(1) Open access door in under surface of wing between inboard and center inboard flap tracks.

(2) Disconnect valve push-pull rod from spoiler selector valve arm and remove valve arm return spring.

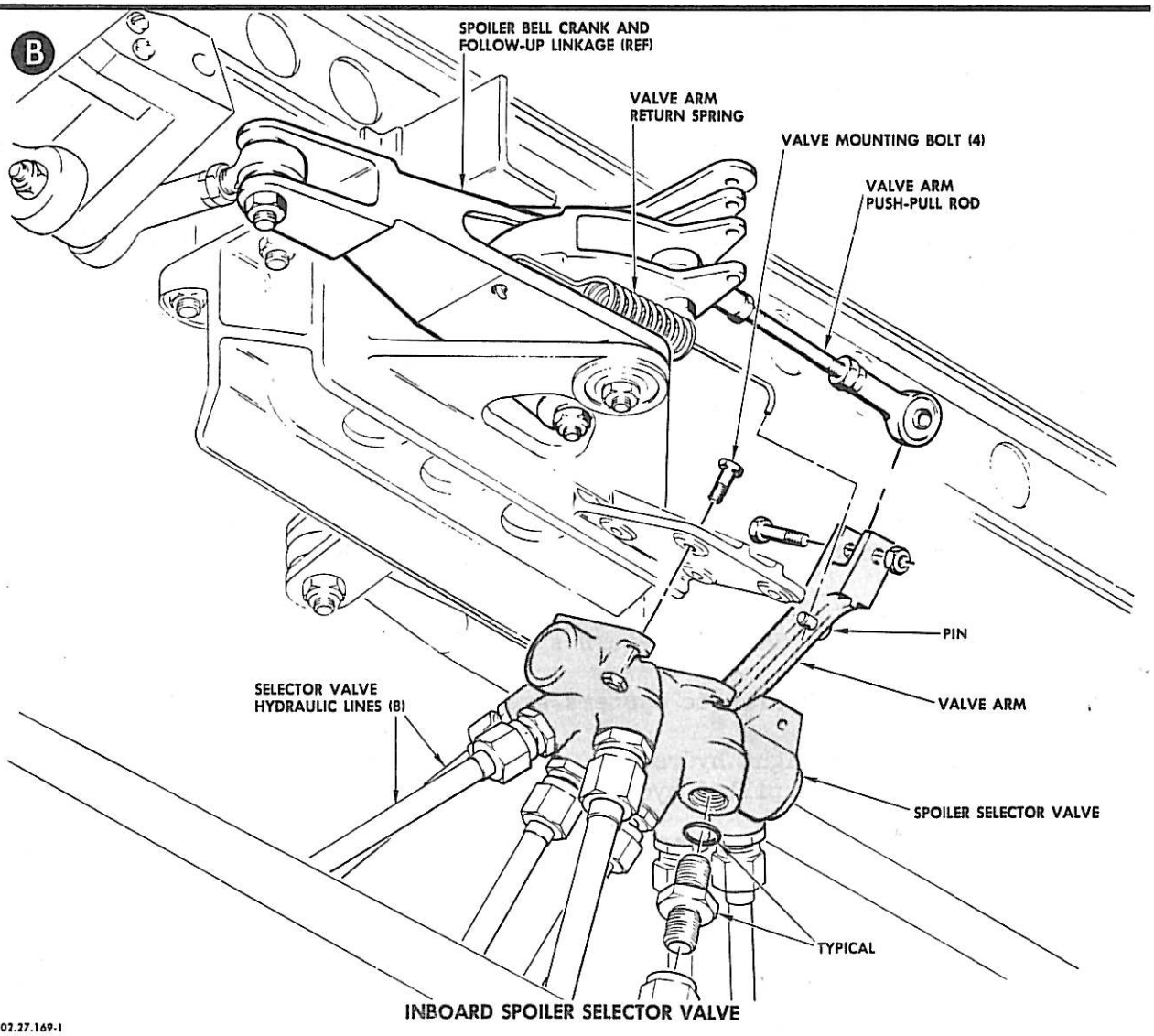
(3) Check that hydraulic systems are depressurized.

(4) Disconnect eight hydraulic lines from ports beneath selector valve. Wipe up any spilled hydraulic fluid.

(5) Remove four mounting bolts and separate selector valve from pad.



INBOARD SPOILER



INBOARD SPOILER SELECTOR VALVE

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C. Install Inboard Spoiler Selector Valve.

(1) Position selector valve on pad and install four mounting bolts.

(2) Install eight hydraulic lines on valve ports.

(3) Insert index pins 22-J107-2.0 in spoiler control bell crank and in selector valve arm.

(4) Adjust length of selector valve arm push-pull rod as necessary to align bolt hole in rod end with holes in valve arm, shorten push-pull rod 2 1/2 turns, remove index pin from valve arm, install inboard end of push-pull rod on valve arm, and tighten check nut on rod end.

(5) Install valve arm return spring.

(6) Remove index pin from spoiler control bell crank and bleed spoiler system (refer to 27-3-0, Adjustment/Test - Spoiler Control System Bleeding Procedure).

(7) Check spoiler operation (refer to 27-3-0, Adjustment/Test Spoiler/ Speed Brake Functional Test).

NOTE: If an inboard spoiler selector valve only has been replaced and no other rigging or adjustment has been changed, check spoiler operation per 27-3-0, paragraphs 2.D., 2.E., 2.F., and 2.G.

OUTBOARD SPOILER CONTROL MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation - Outboard Spoiler Control Bell Crank Assembly (see Figure 201)

   A. Equipment Required.

      (1) Index pins No. 22-J107-2.0 and -2.5.

   B. Remove Outboard Spoiler Control Bell Crank Assembly.

      (1) Open access door in under surface of wing between outboard spoiler inboard and center flap tracks.

      (2) Disconnect outboard end of selector valve push-pull rod from aft arm of control bell crank and remove valve spring.

      (3) Disconnect forward end of followup push-pull rod from outboard arm of control bell crank.

      (4) Disconnect outboard end of spoiler retract actuator push-pull rod from forward arm of control bell crank.

      (5) Remove four bolts attaching selector valve to pad on bell crank assembly and separate valve from pad.

      (6) Remove four bolts attaching bell crank assembly to structure and remove bell crank assembly.

   C. Install Outboard Spoiler Control Bell Crank Assembly.

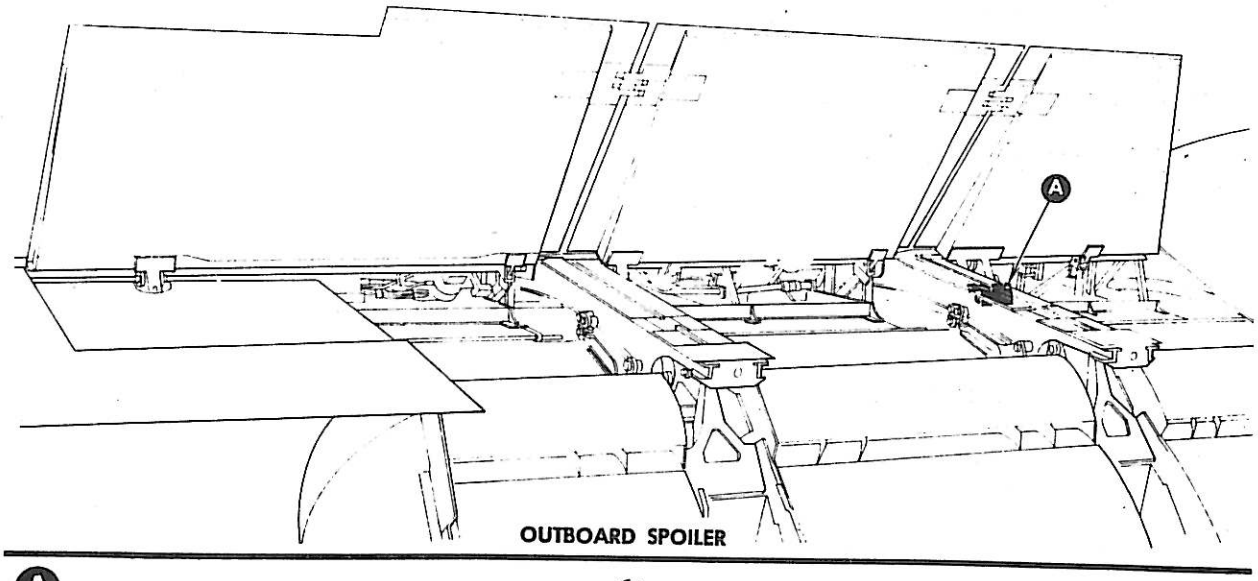
      (1) Position outboard spoiler control bell crank assembly and install four bolts attaching assembly to structure.

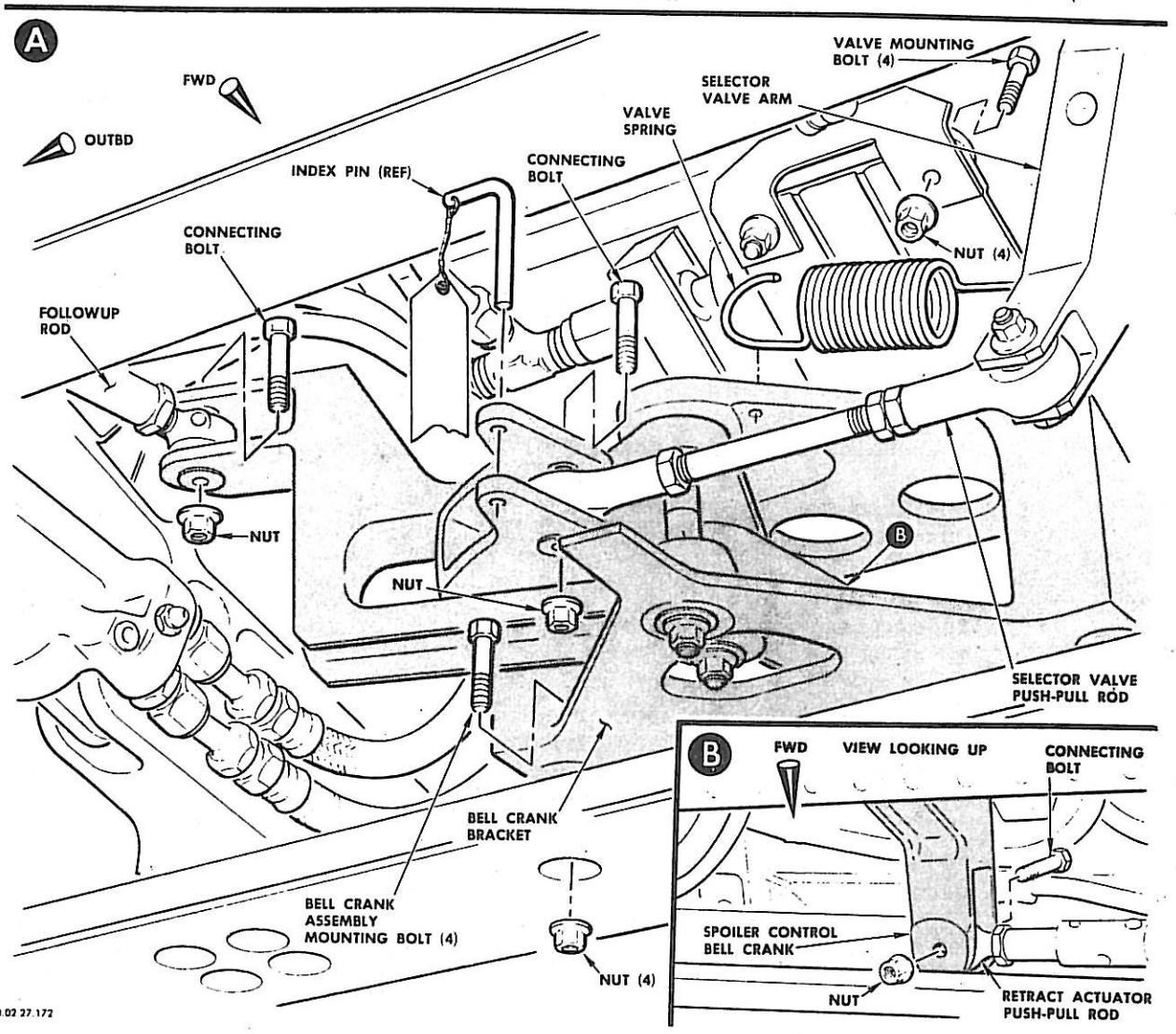
      (2) Position spoiler selector valve on valve pad and install four mounting bolts.

      (3) Insert index pin No. 22-J107-2.5 in spoiler outboard idler and index pins 22-J107-2.0 in outboard spoiler control bell crank and in selector valve arm.

      (4) Check that outboard spoiler retract actuator is in the electrically extended position by applying 28 volts dc across pins B and C of actuator electrical connector. If not fully extended, actuator will run to extended position.

      (5) Adjust length of actuator push-pull rod as necessary to distance between spoiler outboard idler and forward arm of spoiler control bell crank, install forward end of push-pull rod on forward arm of bell crank, and tighten check nut on rod end.





Outboard Spoiler Control Bell Crank Assembly Installation
Figure 201

(6) Check that spoiler is in "full down" position and adjust length of spoiler followup push-pull rod as necessary to distance between extension on spoiler actuator connecting bolt and rigged bell crank.

(7) Connect forward end of followup push-pull rod to bell crank outboard arm and tighten check nut on rod end.

(8) Adjust length of selector valve push-pull rod as necessary to align hole in push-pull rod with holes in aft arm of control valve bell crank, shorten push-pull rod 1/2 turn, remove index pin from selector valve arm, connect free end of push-pull rod on aft arm of bell crank, and tighten check nut on rod end.

(9) Install valve spring and remove index pins from spoiler outboard idler and from control bell crank.

(10) Test spoiler system (refer to 27-3-0, Adjustment/Test Spoiler/ Speed Brake System Functional Test).

NOTE: If an outboard spoiler control bell crank assembly only has been replaced and no other rigging or adjustment has been changed, check spoiler operation per 27-3-0, TABLE I, SPOILER DEFLECTION CHECKS, and paragraphs 2.D. and 2.E.

2. Removal/Installation - Outboard Spoiler Selector Valve (see Figure 202)

A. Equipment Required.

(1) Two index pins No. 22-J107-2.0.

(2) Receptacle to drain disconnected hydraulic lines.

B. Remove Outboard Spoiler Selector Valve.

(1) Open access door in under surface of wing between outboard spoiler inboard and center flap tracks.

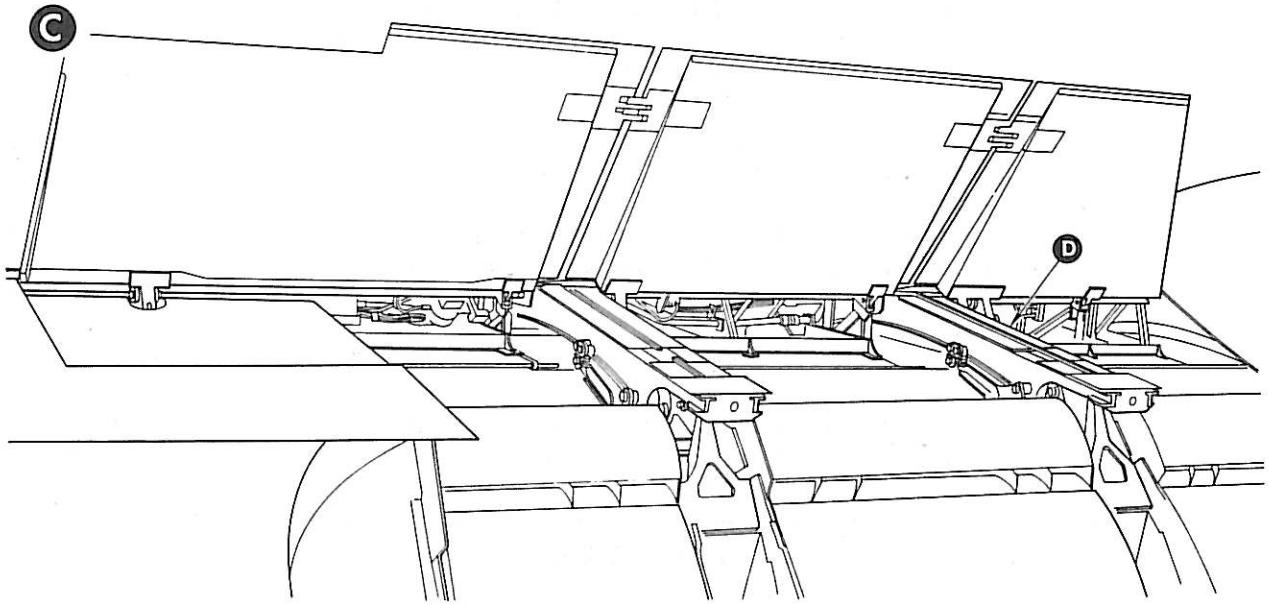
(2) Disconnect selector valve push-pull rod from valve arm and remove valve arm return spring.

(3) Check that hydraulic systems are depressurized.

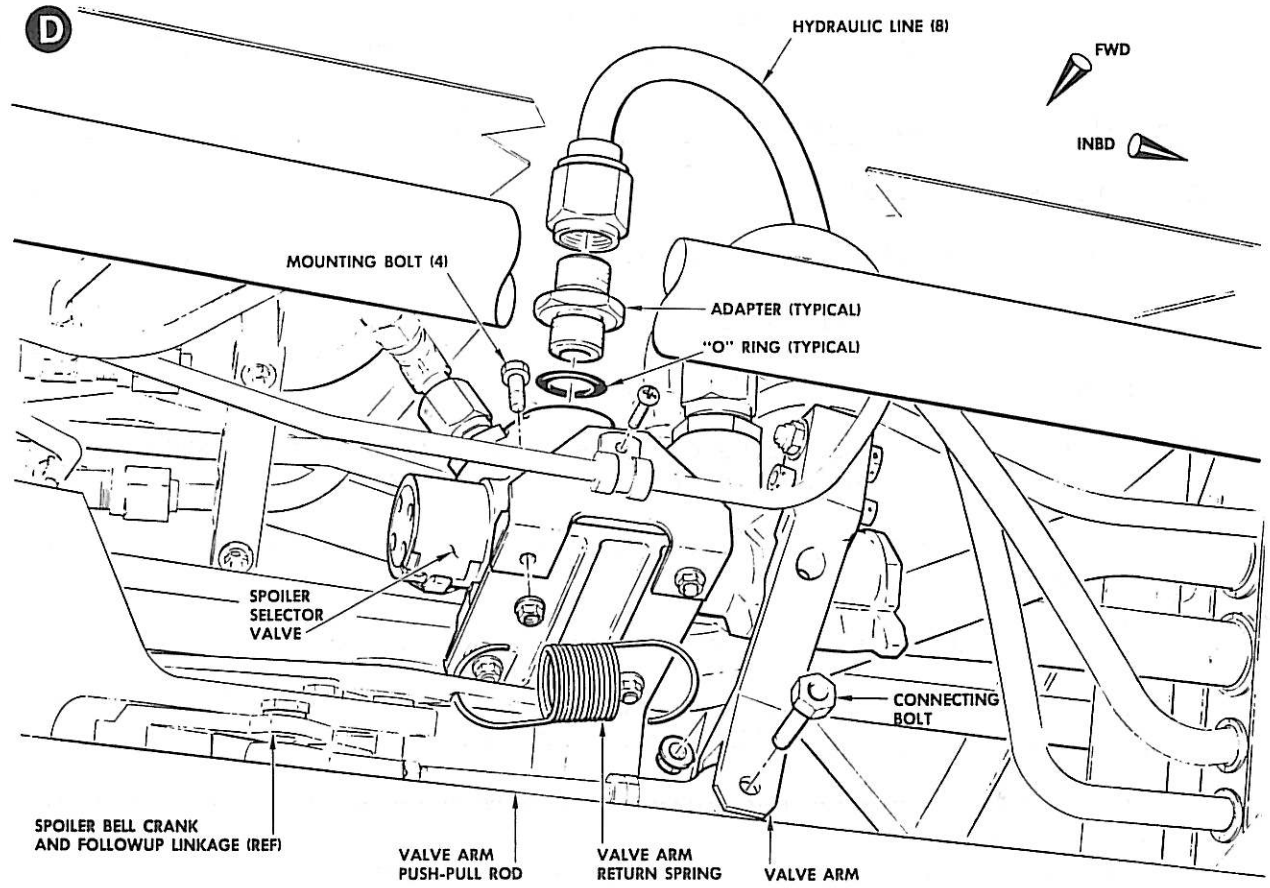
(4) Disconnect eight hydraulic lines from ports above selector valve and wipe up any spilled hydraulic fluid.

(5) Remove four mounting bolts and separate selector valve from pad.

(6) Remove valve from surrounding installations.



OUTBOARD SPOILER



OUTBOARD SPOILER SELECTOR VALVE

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C. Install Outboard Spoiler Selector Valve.

(1) Position spoiler selector valve on pad and install four mounting bolts.

(2) Install eight hydraulic lines on valve ports on top of selector valve.

(3) With spoiler in "full down" position insert index pins No. 22-J107-2.0 in spoiler control bell crank and in selector valve arm.

(4) Adjust length of valve arm push-pull rod as necessary to align bolt hole in rod end with holes in valve arm, shorten push-pull rod 1/2 turn, remove index pin from valve arm, install inboard end of push-pull rod on valve arm, and tighten check nut on rod end.

(5) Install valve spring and remove index pin from spoiler control bell crank.

(6) Bleed spoiler hydraulic system (refer to 27-3-0, Adjustment/Test - Spoiler Control System Bleeding Procedure).

(7) Check spoiler operation (refer to 27-3-0, Adjustment/Test Spoiler/ Speed Brake Functional Test).

NOTE: If an outboard spoiler selector valve only has been replaced and no other rigging or adjustment has been changed, check spoiler operation per 27-3-0, paragraphs 2.D., 2.E., 2.F., and 2.G.

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-34.

Insert facing 27-3-6, Page 201, dated Feb. 15/63 (or subsequent).

The instructions in this temporary revision are applicable to airplanes not modified per Service Bulletin No. 27-25. For airplanes that have been modified per Service Bulletin No. 27-25, use the instructions on 27-3-6, Page 201.

Retain this temporary revision in your manual until all applicable airplanes have been modified per noted service bulletin.

Page 201, delete steps A. (3) and B. (8).

SPOILER/SPEED BRAKE MIXER - MAINTENANCE PRACTICES

1. Removal/Installation - Spoiler/Speed Brake Mixer (see Figure 201)

A. Equipment Required.

(1) Index pins No. 22-J107-2.0 and -5.0.

(2) Spring scale.

(3) Safety wire - corrosion resistant steel 0.051-inch diameter (MS20995C51).

B. Remove Spoiler/Speed Brake Mixer.

(1) Open WARN HORN circuit breaker on main circuit breaker panel.

(2) Gain access to hydraulic compartment.

(3) Disconnect electrical wires from speed brake warning horn switch on speed brake quadrant at top of mixer.

(4) Remove clevis pin and detach centering spring from mixer mounting frame. Swing cam roller arm aft to clear mixer units.

(5) Detach inboard end of control rod from swinging frame aft of mixer.

(6) Detach lower end of speed brake push-pull rod from mixer cable quadrant arm on top of mixer.

(7) Detach inboard rod ends of spoiler override springs from mixer horizontal levers.

(8) Disconnect spoiler no-back spring at each end and cut safety wire at quadrant.

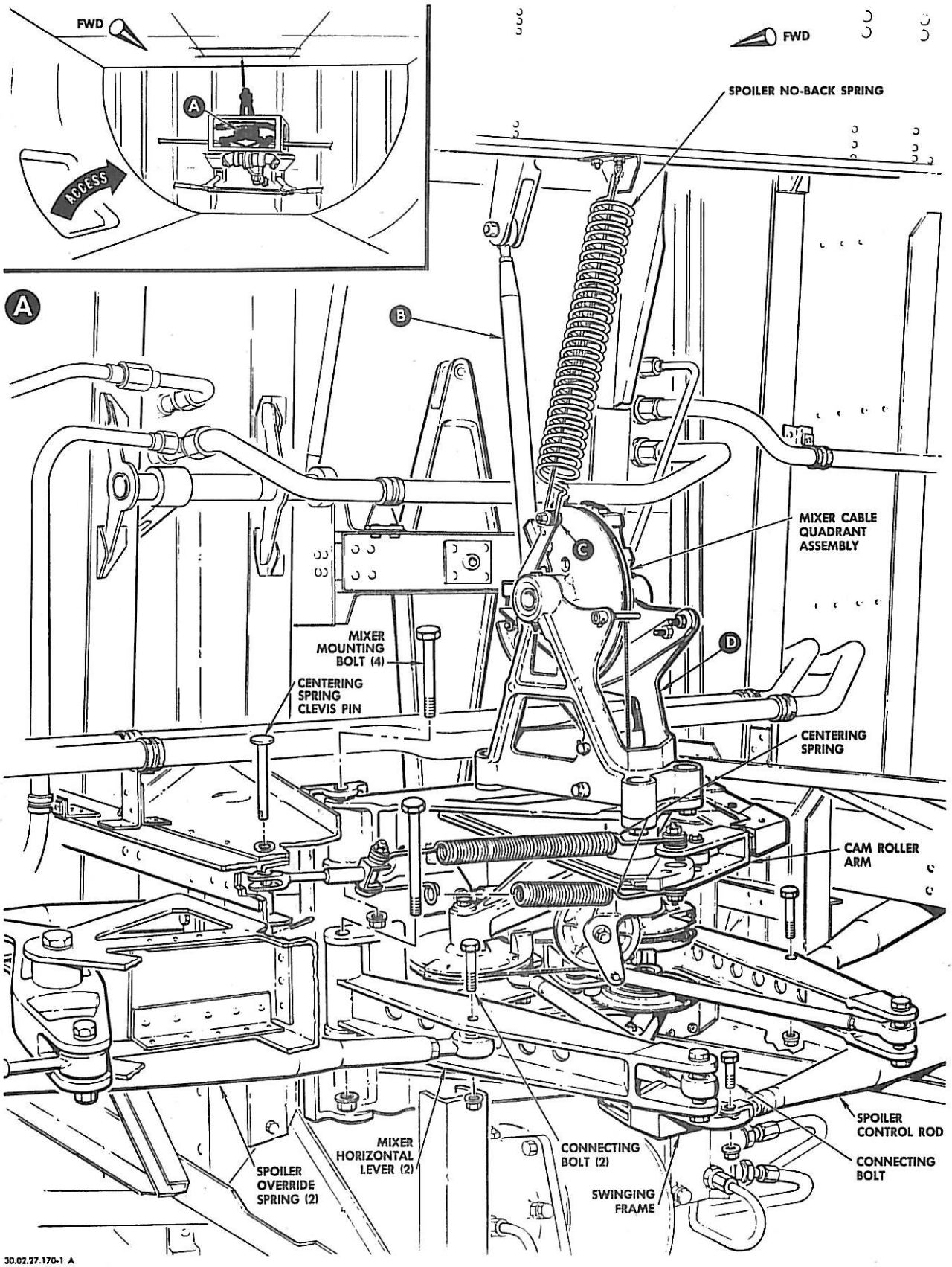
(9) Remove four bolts attaching mixer to mixer mounting frame and lift mixer clear of surrounding frame members.

C. Install Spoiler/Speed Brake Mixer.

NOTE: Normally, the speed brake cables in the mixer will be adjusted prior to installing the mixer. If not, adjust mixer cables (refer to 27-3-0, steps 1.E.(8) through 1.E.(13), Adjustment/Test - Adjust Spoiler System).

(1) Position mixer unit in mixer mounting frame and install four mounting bolts.

(2) Release speed brake handle from "stowed" position and insert index pins No. 22-J107-2.0 in speed brake aft cable quadrant and in mixer cable quadrant on top of mixer.



Spoiler/Speed Brake Mixer Installation
Figure 201 (Sheet 1 of 2)

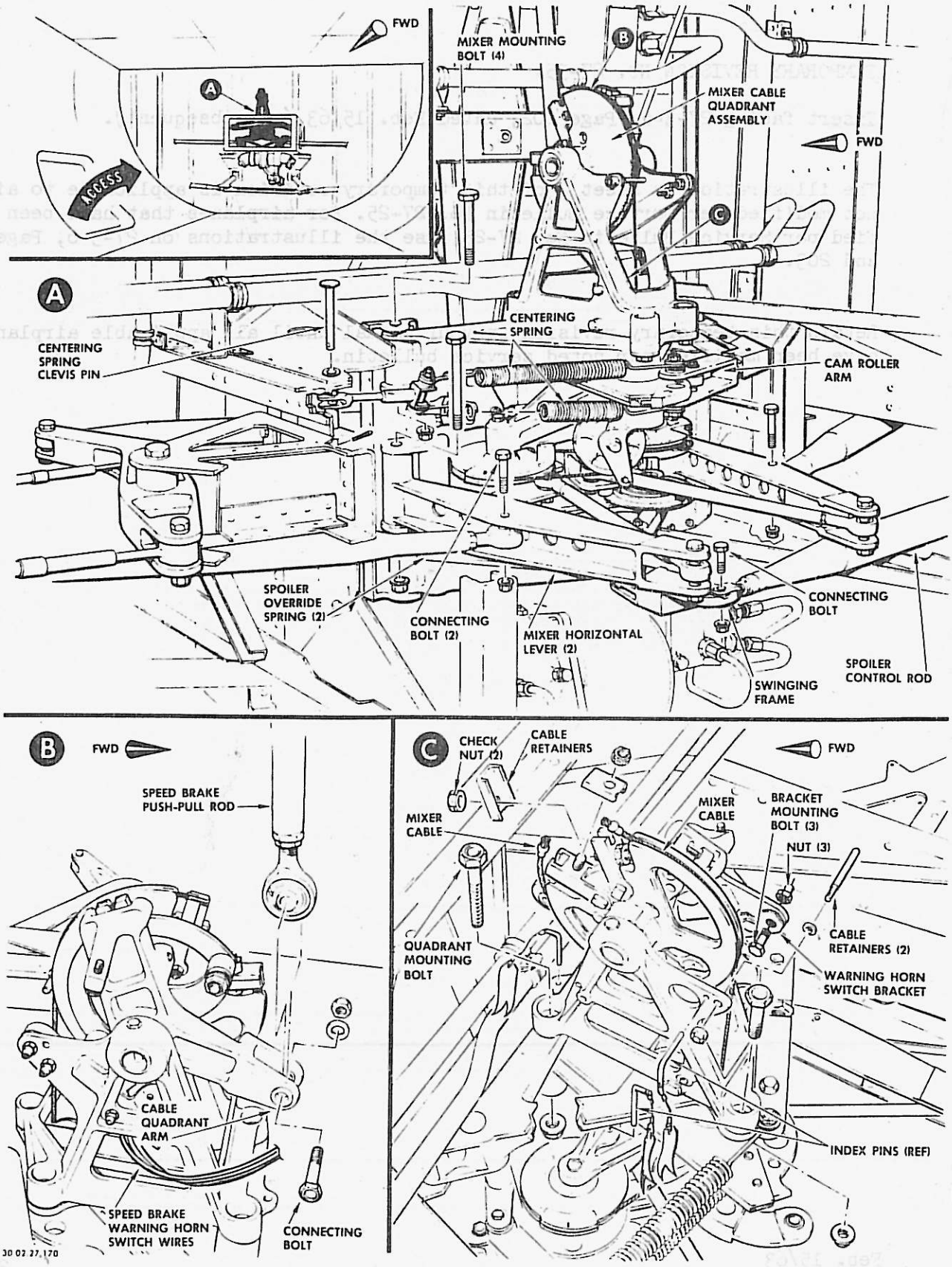
TEMPORARY REVISION NO. 27-35.

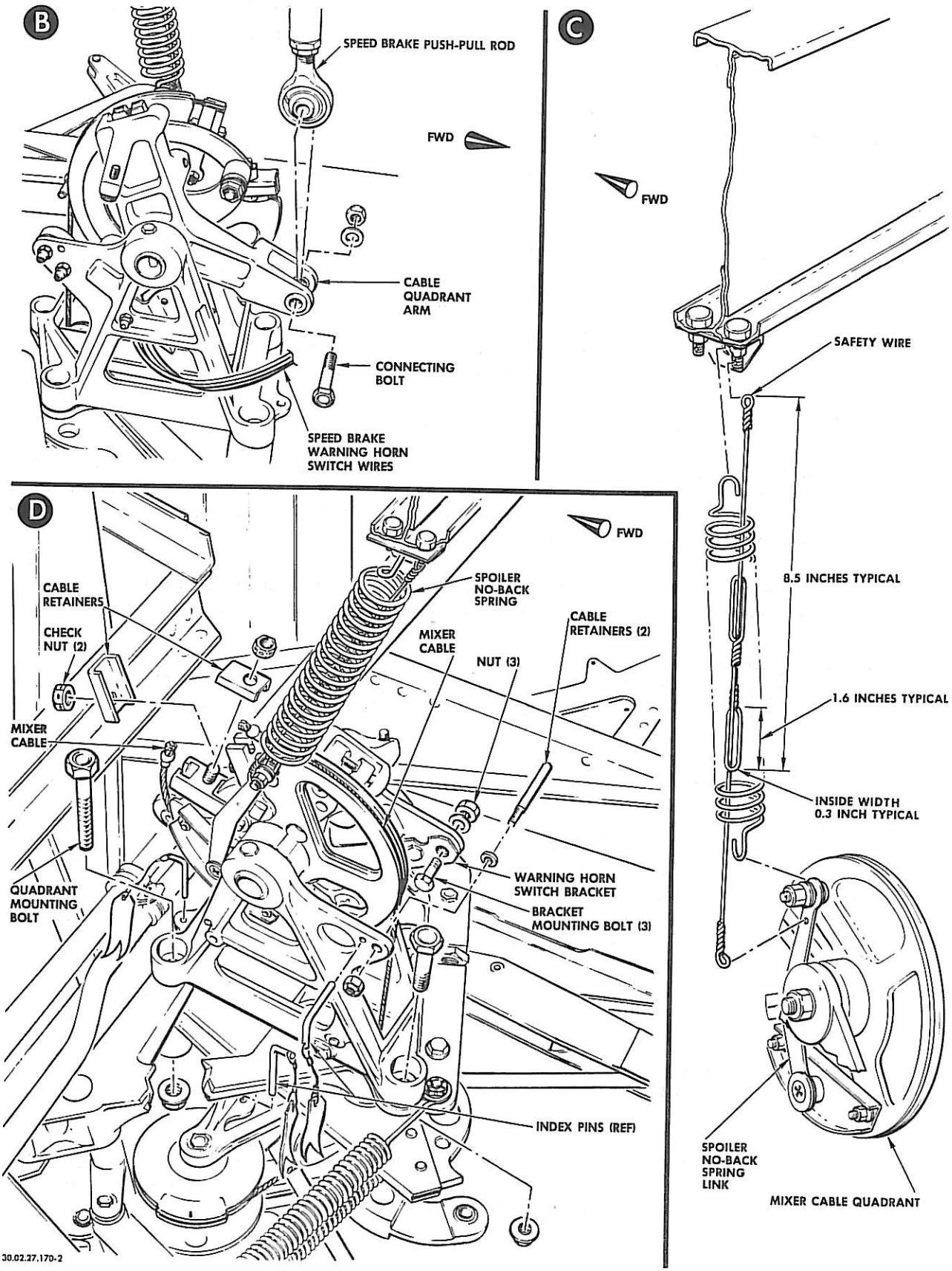
Insert facing 27-3-6, Page 202, dated Feb. 15/63 (or subsequent).

The illustration on sheet 2 of this temporary revision is applicable to airplanes not modified per Service Bulletin No. 27-25. For airplanes that have been modified per Service Bulletin No. 27-25, use the illustrations on 27-3-6, Pages 202 and 203.

Retain this temporary revision in your manual until all applicable airplanes have been modified per noted service bulletin.

TEMPORARY REVISION NO. 27-35.




B
SPEED BRAKE PUSH-PULL ROD
FWD
CABLE QUADRANT ARM
CONNECTING BOLT
SPEED BRAKE WARNING HORN SWITCH WIRES
C
FWD
SAFETY WIRE
8.5 INCHES TYPICAL
1.6 INCHES TYPICAL
INSIDE WIDTH 0.3 INCH TYPICAL
SPOILER NO-BACK SPRING LINK
MIXER CABLE QUADRANT
D
FWD
CABLE RETAINERS
CHECK NUT (2)
MIXER CABLE
SPOILER NO-BACK SPRING
MIXER CABLE
NUT (3)
CABLE RETAINERS (2)
MIXER CABLE
QUADRANT MOUNTING BOLT
WARNING HORN SWITCH BRACKET
BRACKET MOUNTING BOLT (3)
INDEX PINS (REF)
30.02.27.170-2

(3) Adjust length of vertical push-pull rod as necessary to distance between rigged speed brake cable quadrant and mixer cable quadrant, install lower end of push-pull rod on mixer cable quadrant, and tighten check nut on rod end.

(4) Remove index pin from aft speed brake cable quadrant.

(5) Insert index pin No. 22-J107-5.0 in forward arm of swinging frame.

(6) Swing cam roller arm forward and check that roller centers in bottom of cam detent. If not, remove lock bolt from cam roller arm, loosen fork end lock nut, and adjust length of fork end as necessary to center roller in cam detent.

(7) Install lock bolt in cam roller arm, tighten lock nut, and connect centering spring to mixer mounting frame.

(8) Remove index pin from swinging frame.

(9) Adjust centering spring turnbuckle so that a force of 6.25 (±0.70) pounds imposed at the control rod attachment point at the aft end of the swinging frame is required to initiate movement of the swinging frame. Secure turnbuckle with safety wire.

(10) Insert index pin No. 22-J107-2.0 in spoiler control aft bell crank and index pin No. 22-J107-5 in forward arm of swinging frame.

(11) Adjust length of control rod as necessary to distance between rigged bell crank and swinging frame, install inboard end of control rod on aft arm of swinging frame, and tighten check nut on rod end.

(12) Remove index pin from spoiler control aft bell crank.

(13) Install index pins No. 22-J107-2.0 in spoiler intersonnect bell cranks in LH and RH wings.

(14) Adjust length of spoiler override springs as necessary to align bolt holes in override spring rod ends with bolt holes in horizontal levers at sides of mixer.

(15) Install inboard ends of override springs on horizontal levers and tighten check nuts on rod ends of override springs.

(16) Remove index pins from mixer cable quadrant, from forward arm of swinging frame, and from interconnect bell cranks in LH and RH wings.

(17) Replace safety wire cut in step B.(8). See dimensions of loop and overall length of wire in Figure 201. Place no-back spring over safety wire. Attach safety wire to quadrant and install no-back spring.

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-36.

Insert facing 27-3-6, Page 204, dated Feb. 15/63 (or subsequent).

The instructions in this temporary revision are applicable to airplanes not modified per Service Bulletin No. 27-25. For airplanes that have been modified per Service Bulletin No. 27-25, use the instructions on 27-3-6, Page 204.

Retain this temporary revision in your manual until all applicable airplanes have been modified per noted service bulletin.

Page 204, delete step (17).

TEMPORARY REVISION NO. 27-37.

Insert facing 27-3-6, Page 205, dated Feb. 15/63 (or subsequent).

The instructions in this temporary revision are applicable to airplanes not modified per Service Bulletin No. 27-25. For airplanes that have been modified per Service Bulletin No. 27-25, use the instructions on 27-3-6, Page 205.

Retain this temporary revision in your manual until all applicable airplanes have been modified per noted service bulletin.

Page 205, delete step B.(6).

(18) Check that speed brake warning horn switch actuates when speed brake control lever is moved closer than 0.16 inch from "stowed" position. If not, loosen two mounting screws and adjust position of switch as necessary.

(19) Attach electrical wires to speed brake warning horn switch.

(20) Test spoiler/speed brake system (refer to 27-3-0, Adjustment/Test - Spoiler/Speed Brake System Functional Test).

NOTE: If the spoiler/speed brake mixer only has been replaced and no other rigging or adjustment has been changed, check spoiler operation per 27-3-0, TABLE I, SPOILER DEFLECTION CHECKS, and paragraphs 2.C. and 2.J.

2. Removal/Installation - Mixer Cable Quadrant Assembly (see Figure 201)

A. Equipment Required.

(1) Spring scale calibrated from 0 to 10 pounds.

(2) Index pins No. 22-J107-2.0.

(3) Deleted.

B. Remove Mixer Cable Quadrant Assembly.

(1) Open WARN HORN circuit breaker on main circuit breaker panel.

(2) Gain access to hydraulic compartment.

(3) Remove three bolts and detach warning horn switch bracket from mixer cable quadrant frame.

(4) Disconnect push-pull rod from mixer cable quadrant input arm.

(5) Loosen check nuts and back off screws in cable retainers to relieve cable tension and disconnect cables from retainers.

(6) Disconnect spoiler no-back spring at each end and cut safety wire at quadrant.

(7) Remove four mounting bolts and detach mixer cable quadrant assembly from mixer housing.

C. Install Mixer Cable Quadrant Assembly.

(1) Position mixer cable quadrant assembly on top of mixer housing and install four mounting bolts.

(2) Release speed brake handle from stowed position and insert index pins No. 22-J107-2.0 in speed brake aft cable quadrant on aft general controls support installation and in mixer cable quadrant.

(3) Adjust length of push-pull rod as necessary to distance between rigged bell crank and cable quadrant, install lower end of push-pull rod on input arm of mixer cable quadrant, and tighten check nut on rod end.

(4) Position warning horn switch bracket on mixer cable quadrant and install four mounting bolts.

(5) Check that warning horn switch actuates when speed brake lever is moved closer than 0.16 inch to stowed position. If not, loosen two screws attaching switch to bracket, adjust position of switch as necessary for proper operation, and tighten screws attaching switch to bracket.

(6) Install free ends of mixer cables in cable retainers and increase tension until a force of 6.9 (±0.5) pounds exerted by a spring scale on the aft mixer cable 4.5 inches below the pivot point of the mixer cable quadrant deflects the cable 0.25 (±0.02) inch.

(7) Attempt to insert index pins No. 22-J107-2.0 through LH and RH horizontal cable pulleys in mixer. If index pins can be inserted, tighten check nuts on adjusting screws in cable retainers. If not, alternately loosen and tighten adjusting screws in cable retainers and, if necessary, adjusting screw in retainer on RH horizontal pulley until index pins can be inserted.

(8) Recheck tension of mixer cables, re-adjust tension if necessary, and tighten check nuts on adjusting screws.

(9) Remove index pins from mixer cable quadrant and from horizontal cable pulleys.

(10) Replace safety wire cut in step B.(6). See dimensions of loop and overall length of wire in Figure 201. Place no-back spring over safety wire. Attach safety wire to quadrant and install no-back spring.

(11) Test spoiler/speed brake system (refer to 27-3-0, Adjustment/Test - Spoiler Speed Brake System Functional Test).

NOTE: If the mixer cable quadrant assembly only has been replaced and no other rigging or adjustment has been changed, check speed brake operation per 27-3-0, paragraphs 2.H. and 2.J.

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-38.

Insert facing 27-3-6, Page 206, dated Feb. 15/63 (or subsequent).

The instructions in this temporary revision are applicable to airplanes not modified per Service Bulletin No. 27-25. For airplanes that have been modified per Service Bulletin No. 27-25, use the instructions on 27-3-6, Page 206.

Retain this temporary revision in your manual until all applicable airplanes have been modified per noted service bulletin.

Page 206, delete step (10).

SPOILER RETRACT ACTUATORS - MAINTENANCE PRACTICES

1. Removal/Installation - Inboard Spoiler Retract Actuator (see Figure 201)

A. Equipment Required.

(1) Two index pins No. 22-J107-2.0.

B. Remove Inboard Spoiler Retract Actuator.

(1) Open access door in under surface of wing between inboard and center inboard flap tracks.

(2) Open INBD SPOILER DE-ACTIVATION circuit breaker and disconnect electrical connector from actuator electrical receptacle.

(3) Remove bolt attaching inboard end of retract actuator to spoiler interconnect bell crank.

(4) Detach actuator rod end from inboard spoiler control mechanism bell crank and remove actuator.

C. Install Inboard Spoiler Retract Actuator.

(1) Check that retract actuator is in electrical extended position by applying 28 volts dc across pins B and C of actuator electrical receptacle. If not fully extended, actuator will run to extended position.

NOTE: Prior to connecting actuator to spoiler interconnect bell crank in the following step, check interconnect bell crank two-bearing assemblies for evidence of binding on bolt, ratcheting, or excessive wear. Replace defective bearings (refer to 27-0, Bell Crank Bearing Installation - Typical).

(2) Position inboard spoiler retract actuator and install bolt attaching inboard end of actuator to spoiler interconnect bell crank.

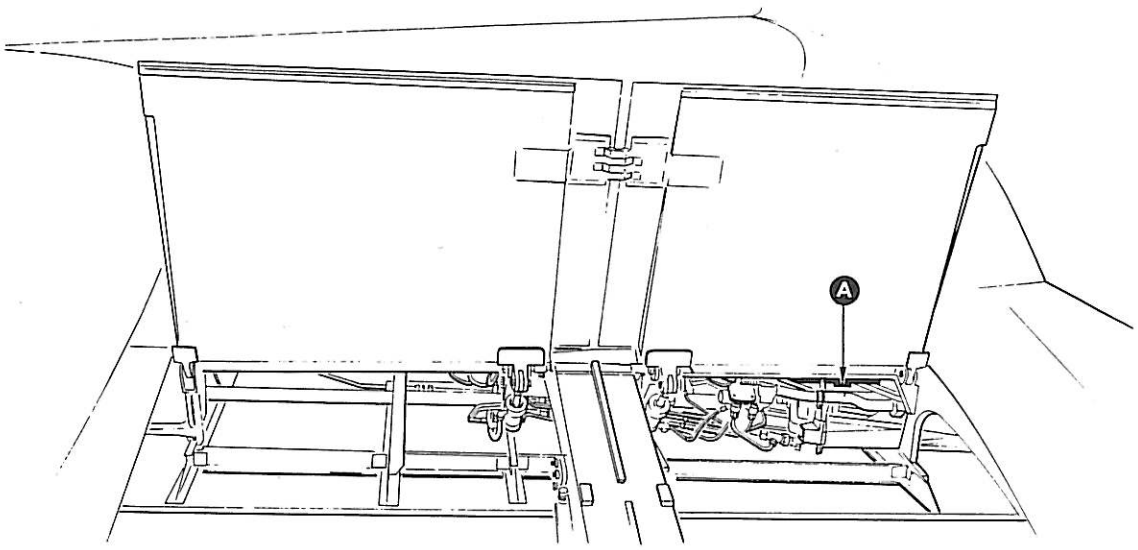
(3) Insert index pins No. 22-J107-2.0 in spoiler interconnect bell crank and inboard spoiler control mechanism bell crank.

(4) Loosen check nut on actuator rod end, adjust length of actuator rod as necessary to distance between rigged bell cranks, install actuator rod end on spoiler control mechanism bell crank, and tighten check nut on rod end.

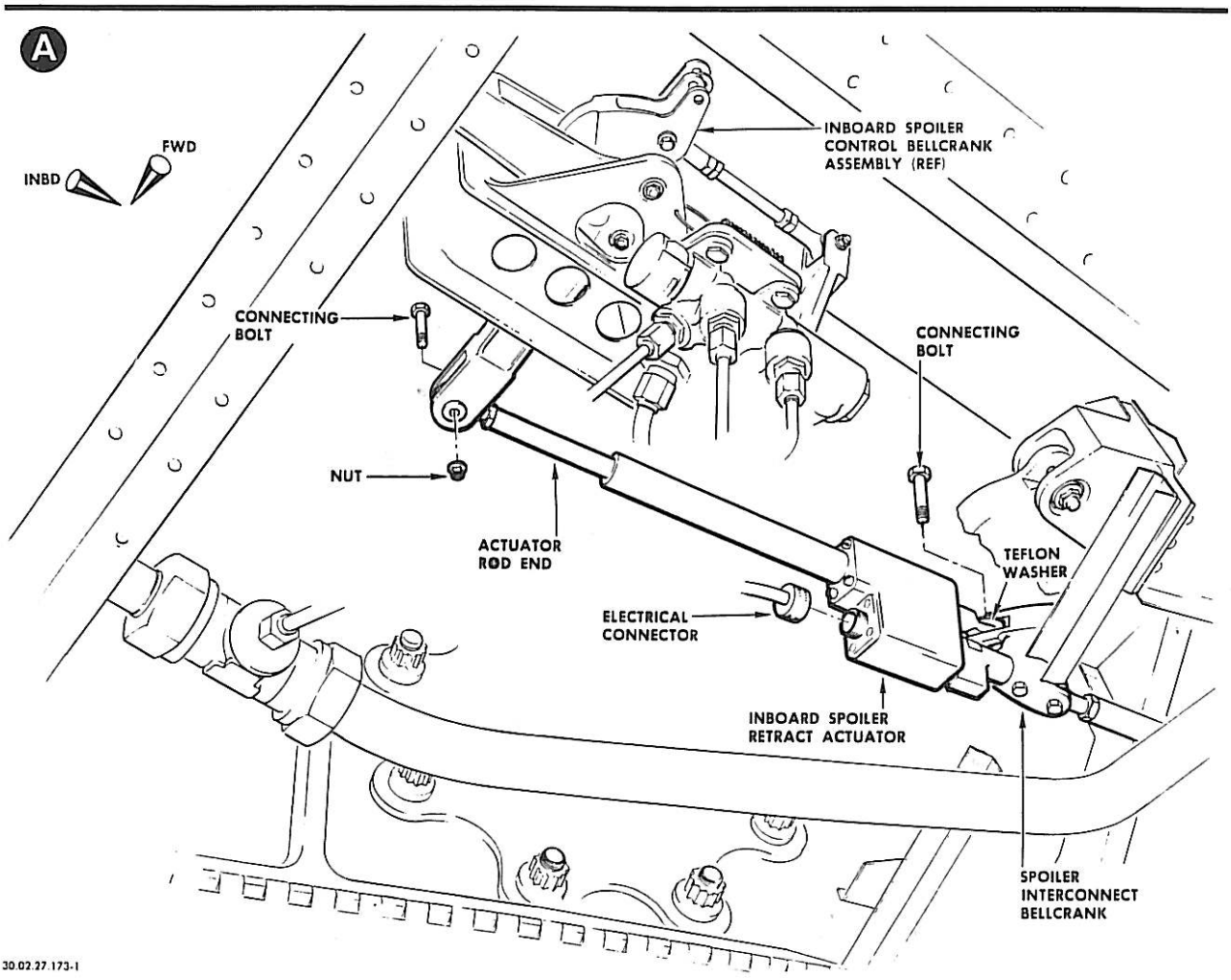
(5) Connect electrical connector to actuator receptacle.

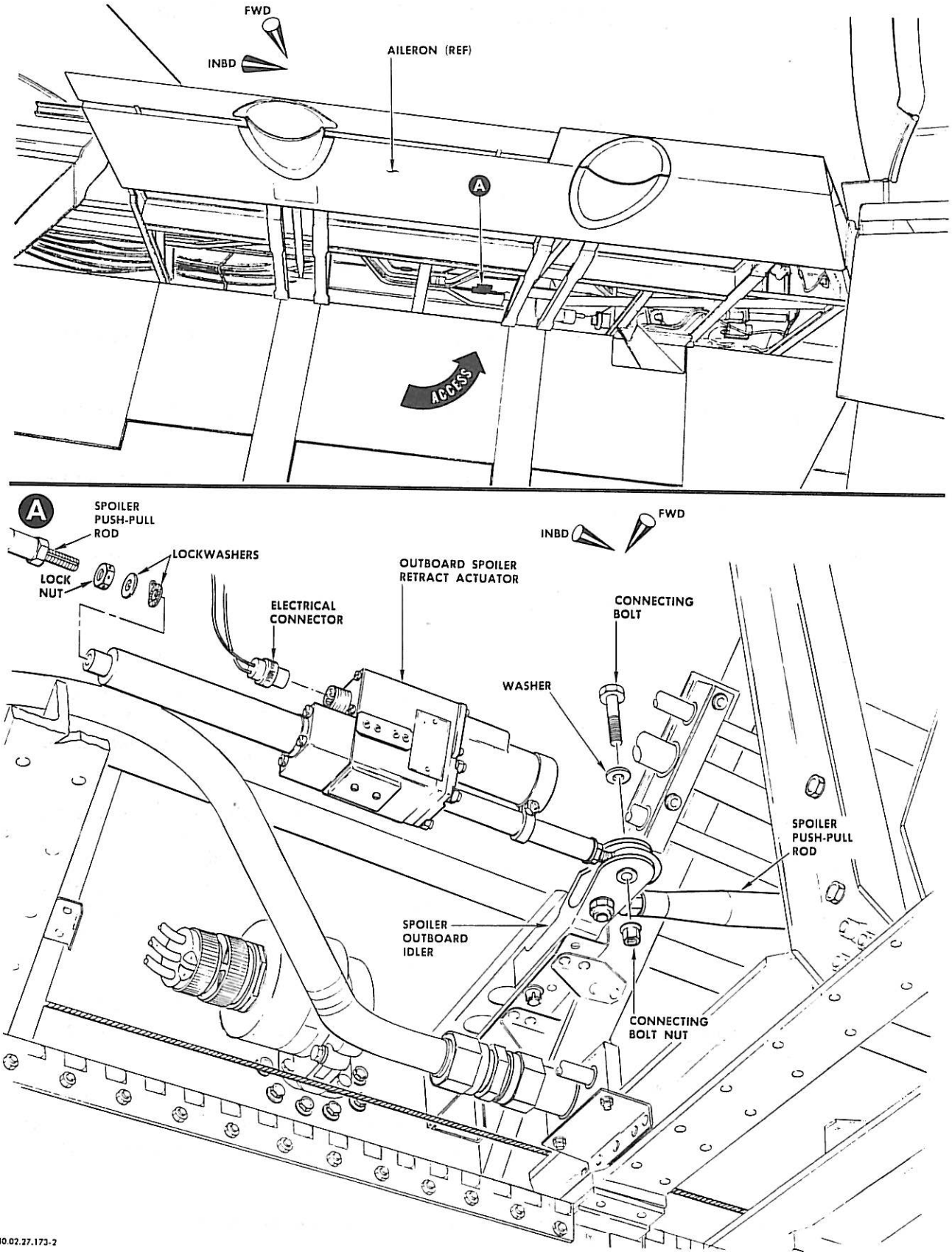
(6) Remove index pins from spoiler interconnect and spoiler mechanism control bell cranks and test spoiler system (refer to 27-3-0, Adjustment/Test - Spoiler/Speed Brake System Functional Test).

NOTE: If an inboard spoiler retract actuator only has been replaced and no other rigging or adjustment has been changed, check spoiler operation per 27-3-0, TABLE I, SPOILER DEFLECTION CHECKS, and paragraph 2.I.



INBOARD SPOILER





Outboard Spoiler Retract Actuators
Installation
Figure 202

2. Removal/Installation - Outboard Spoiler Retract Actuator (see Figure 202)

A. Equipment Required.

(1) Index pins No. 22-J107-2.0 and -2.5.

B. Remove Outboard Spoiler Retract Actuator.

(1) Open OUTBD SPOILER DE-ACTIVATION circuit breaker on main circuit breaker panel.

(2) Open access door in under surface of wing between outboard flap inboard and center flap tracks.

(3) Disconnect electrical connector from retract actuator electrical receptacle.

(4) Remove bolt attaching inboard end of retract actuator to spoiler outboard idler.

(5) Disconnect outboard end of retract actuator control rod from outboard spoiler control mechanism bell crank.

(6) Loosen check nut on retract actuator control rod, unscrew control rod end from actuator rod on outboard end of retract actuator, and remove retract actuator.

C. Install Outboard Spoiler Retract Actuator.

(1) Check that retract actuator is in electrically extended position by applying 28 volts dc across pins B and C of actuator electrical receptacle. If not fully extended, actuator will run to extended position.

(2) Install bolt attaching inboard end of actuator to outboard idler.

(3) Locate lock nut and lock washers on inboard end of spoiler push-pull rod and screw rod end into outboard end of retract actuator until gap between fixer and lock nuts does not exceed 0.25 inch when lock nut is tightened. Torque lock nut from 95 to 110 inch-pounds and secure with safety wire.

(4) Install index pins No. 22-J107-2.5 in spoiler outboard idler and index pin No. 22-J107-2.0 in outboard spoiler control mechanism bell crank.

(5) Adjust length of actuator control rod as necessary to distance between positioned actuator and rigged bell crank, install outboard end of actuator control rod on outboard spoiler control mechanism bell crank, and tighten check nut on rod end.

(6) Connect electrical connector to actuator receptacle.

(7) Remove index pins from spoiler outboard idler and outboard spoiler control mechanism bell crank.

(8) Test spoiler system (refer to 27-3-0, Adjustment/Test - Spoiler/ Speed Brake System Functional Test).

NOTE: If an outboard spoiler retract actuator only has been replaced and no other rigging or adjustment has been changed, check spoiler operation per 27-3-0, TABLE I, SPOILER DEFLECTION CHECKS, and paragraph 2.I.

3. Adjustment/Test - Spoiler Retract Actuator Adjustment (see Figure 202)

A. General.

The spoiler retract actuators should be adjusted only if the LH or RH appropriate inboard or outboard spoiler does not retract to the streamline position when the EMER PITCH switch is placed in the NOSE UP or NOSE DN position.

B. Equipment Required.

(1) External source of electrical power.

(2) External source of hydraulic power.

C. Adjust Spoiler Retract Actuator.

(1) Connect external source of electrical power to airplane and close INBD and OUTBD SPOILER DE-ACTIVATION and FLAP ASYM CONT circuit breakers on main circuit breaker panel (refer to Chapter 24, ELECTRICAL POWER).

(2) Check that flap control lever setting corresponds roughly with position of flaps and connect external source of hydraulic power to airplane (refer to Chapter 29, HYDRAULIC POWER).

(3) Actuate flap control lever to DOWN position and lower flaps.

(4) Move speed brake handle to full aft position and raise spoilers.

(5) Actuate EMER PITCH switch to NOSE UP position and check that both inboard spoilers retract to streamline position.

CAUTION: MAXIMUM OPERATING DUTY CYCLE OF EACH SPOILER RETRACT ACTUATOR IS 10 SECONDS ON, FOLLOWED BY 5 MINUTES OFF.

(6) Actuate EMER PITCH switch to NOSE DN position and check that both outboard spoilers retract to streamline position.

(7) If one or more of the spoilers does not retract to the streamline position, return EMER PITCH switch to NORMAL and adjust each retract actuator that does not retract the associated spoiler to streamline by completing steps (8) and (9).

(8) Cut safety wire on RETRACT LIMIT ADJ screw on side of actuator and turn screw in direction indicated by arrow approximately five turns.

(9) Actuate EMER PITCH switch to NOSE UP or NOSE DN position as appropriate and check whether spoiler being adjusted retracts to streamline position. If not, repeat step (8) as many times as necessary.

(10) When all spoilers retract properly, actuate EMER PITCH switch to NOSE UP and NOSE DN positions and check whether actuator motor shuts off at end of retract stroke. If actuator motor stalls or does not shut off at end of retract stroke, rotate RETRACT LIMIT ADJ screw in direction opposite to that indicated by arrow at five-turn intervals until retract switch shuts off motor at end of retract stroke.

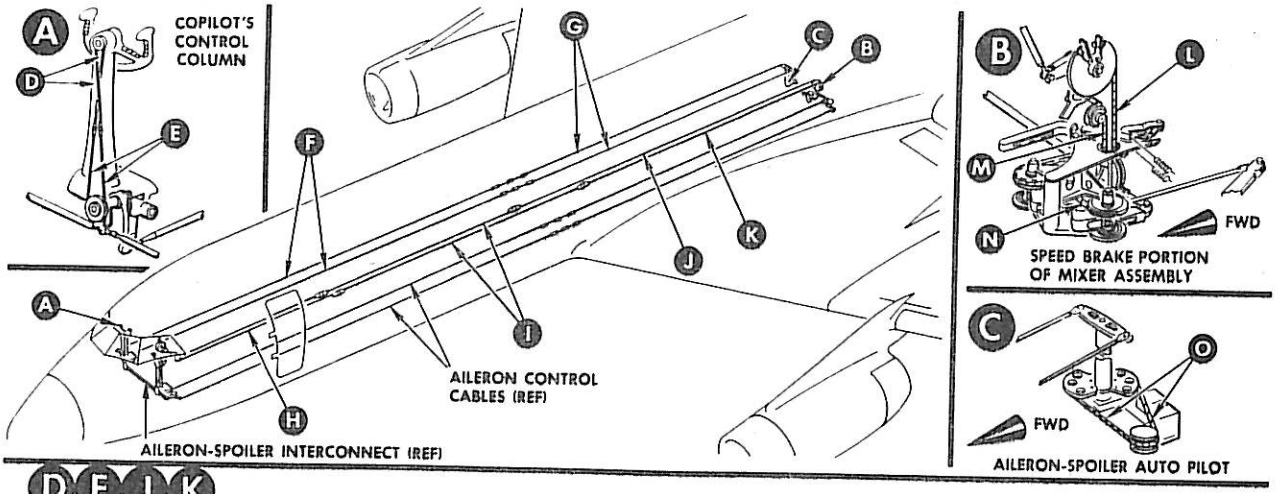
(11) If adjustment in step (10) is necessary for proper actuator operation, it will also be necessary to increase length of stroke of actuator by cutting safety wire and turning EXTEND LIMIT ADJ screw in direction indicated by arrow in five-turn intervals until spoiler being adjusted streamlines with wing when EMER PITCH switch is actuated to NOSE UP or NOSE DN position.

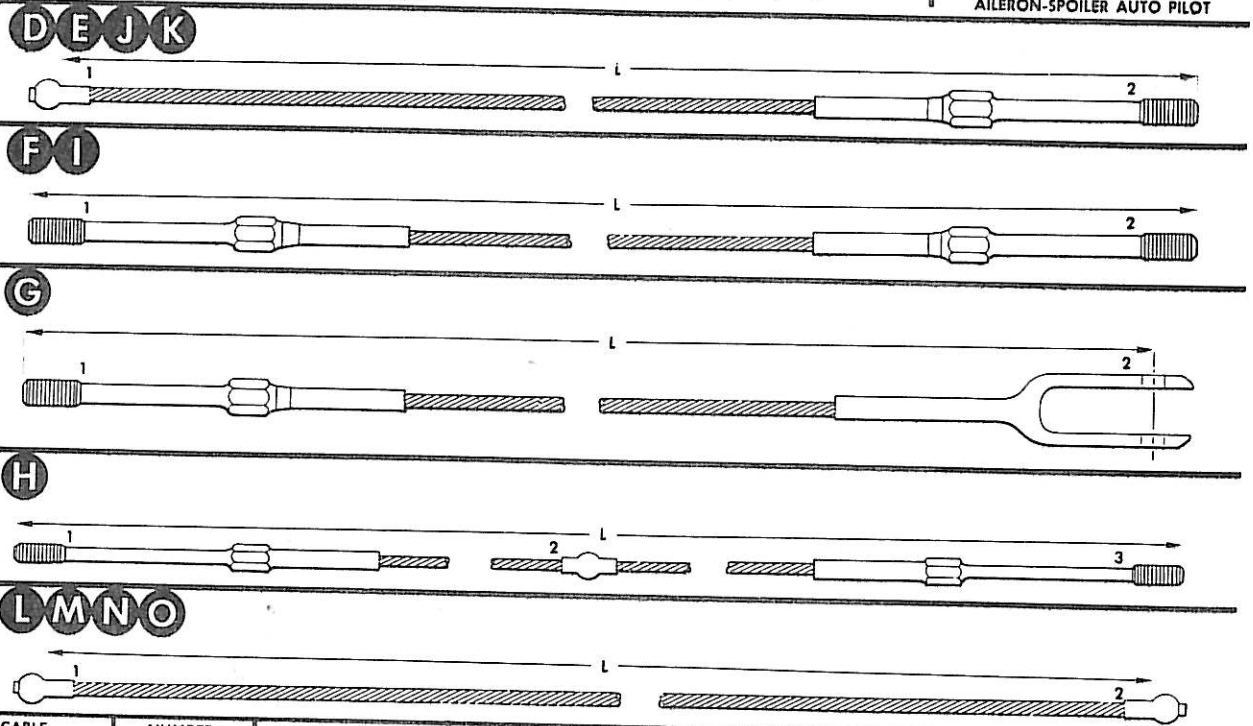
(12) After completing step (11), it will be necessary to disconnect the actuator rod end, insert index pins in the bell crank or idler at each end of actuator, re-adjust length of rod end, connect to bell crank or idler, and tighten check nut.

(13) Remove index pins inserted in step (12) and test spoiler system (refer to Adjustment/Test - Spoiler/Speed Brake System Functional Test).

NOTE: If a spoiler retract actuator only has been adjusted and no other rigging or adjustment has been changed, check spoiler operation per 27-3-0, TABLE I, SPOILER DEFLECTION CHECKS, and paragraph 2.I.

(14) When test is satisfactory, secure RETRACT LIMIT ADJ and EXTEND LIMIT ADJ screws with safety wire.





CABLE REFERENCE	NUMBER REQUIRED	LENGTH	CABLE SIZE	FITTINGS 1	2	3
D	2	24.85	1/8 × 7 × 19	AN 664C4	NAS 650-S4RH	
E	2	16.50	1/8 × 7 × 19	AN664C4	NAS 650-S4LH	
F	2	393.72	1/8 × 1 × 19	NAS 650-L4LH	NAS 650-S4RH	
G	2	347.30	1/8 × 1 × 19	NAS 650-S4LH	AN 658-4	
H	1	538.40	3/32 × 7 × 7	NAS 650-L3RH	AN 663C3	NAS 650-L3RH
I	2	184.40	3/32 × 7 × 7	NAS 650-L3LH	NAS 650-L3RH	
J	1	348.25	3/32 × 7 × 7	AN 664C3	NAS 650-L3LH	
K	1	284.70	3/32 × 7 × 7	AN 664C3	NAS 650-L3LH	
L	1	22.75	3/32 × 7 × 7	AN 664C3	AN 664C3	
M	1	22.875	3/32 × 7 × 7	AN664C3	AN 664C3	
N	1	12.125	3/32 × 7 × 7	AN 664C3	AN 664C3	
O	2	32.00	1/8 × 7 × 19	AN 664C4	AN 664C4	

FLAP CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General

The airplane is equipped with four Fowler-type wing trailing edge flaps, and 16 leading edge flaps to increase the angle of attack at which the airplane stalls and reduce the distance required for takeoff and landing. The 20 extendible control surfaces are controlled simultaneously by means of a common control lever on the pilots' pedestal. For complete description of the leading edge flap system, refer to 27-10-0.

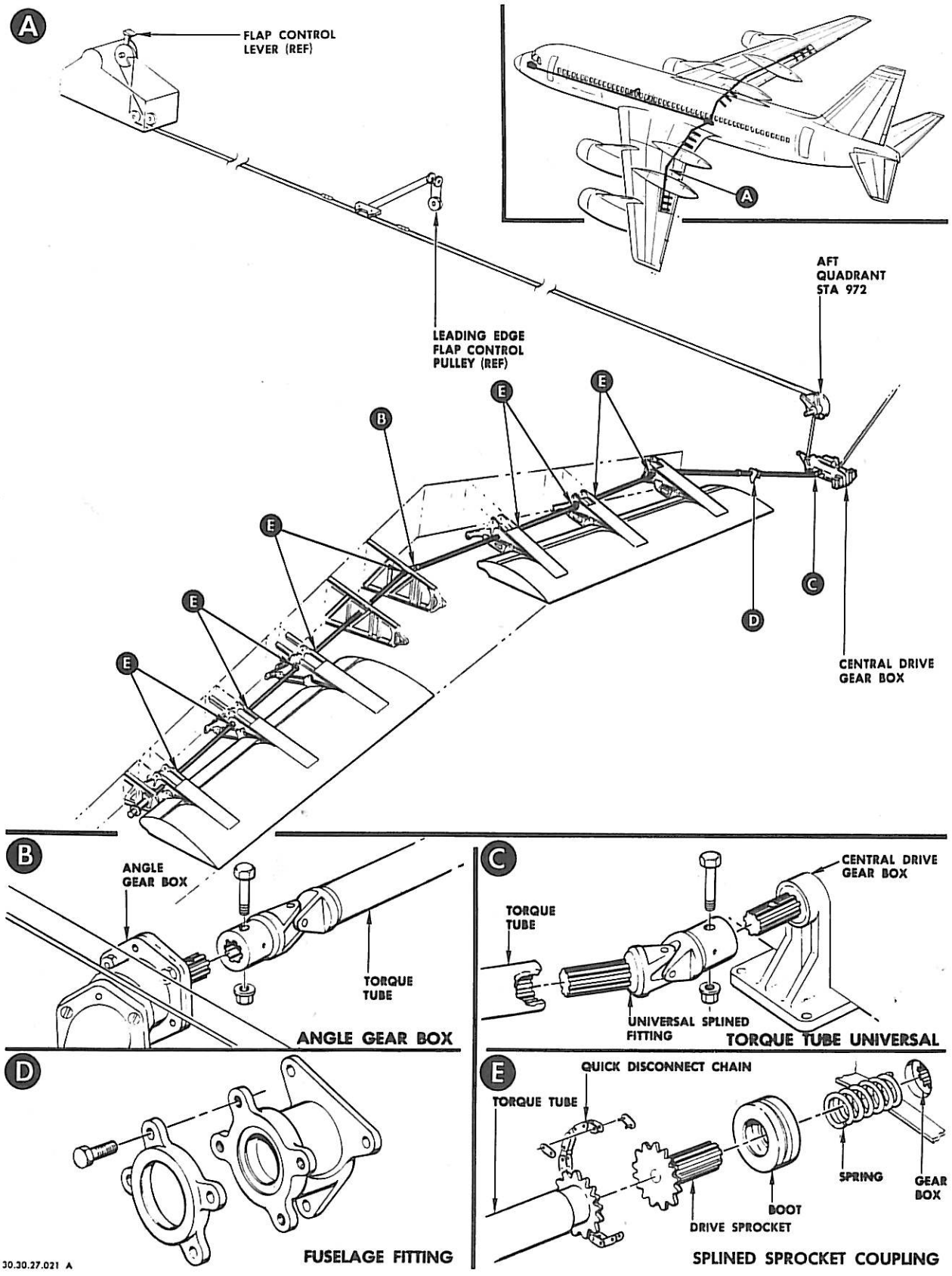
Two Fowler-type flaps are installed in the trailing edge of each wing; one inboard, the other outboard of the aileron. The flaps are supported by roller carriages which ride back and forth in curved steel tracks attached to the wing structure. Each flap is supported by three tracks, and is driven by three recirculating ball bearing type jack screw actuator assemblies attached to the flap structure and the wing rear spar. Actuator gearboxes, driven through torque tubes in the wings, rotate actuator jack screws to drive the flaps. (See Figures 1 and 2).

The trailing edge flaps can be extended approximately 50 degrees but full deflection is limited to airspeeds up to 195 knots IAS (indicated air speed). A placard to the right of the copilot's instrument panel indicates the maximum permissible airspeed for each flap setting. If the flaps are extended beyond the setting permitted for the current airspeed, a FLAP ADJ warning light on the pilots' center instrument panel illuminates. A dual-pointer flap position indicator, marked in 10-degree graduations, is located on the pilots' center instrument panel.

Power to raise and lower the trailing edge flaps is provided by either of two hydraulic motors, each driven by a separate hydraulic system. Both motors are mounted on a central drive gearbox and are connected by a gear train, in the gearbox, to torque tubes extending outboard into the wings aft of the rear spars. The torque tubes connect the recirculating ball bearing type jack screw actuator assemblies to the central drive gearbox. Flow of hydraulic fluid to the flap motors is regulated by a dual three-way control valve (see Figure 3).

Trailing edge flap operation is controlled through a flap control lever mounted in the right side of the pilots' pedestal. Five detents in the flap control lever quadrant provide for flap settings of 0°, 10°, 27°, 36°, and 50°. A trigger operated latch prevents inadvertent movement of the lever. The flap control lever is connected to the self-centering hydraulic flap control valve, on the central drive gearbox, through dual cables and push-pull rods. A followup linkage closes the control valve when the flaps reach the selected position.

Two solenoid-operated flap phase valves, one in the hydraulic pressure line of each hydraulic system, control the flow of hydraulic fluid to the flap motors. These valves are spring-loaded-to-open. A FLAP PWR SELECT switch on the pilots' overhead panel is used to select the hydraulic system to be


A
FLAP CONTROL LEVER (REF)
AFT QUADRANT STA 972
LEADING EDGE FLAP CONTROL PULLEY (REF)
B
E
E
E
E
E
C
D
CENTRAL DRIVE GEAR BOX
B
ANGLE GEAR BOX
TORQUE TUBE
ANGLE GEAR BOX
C
CENTRAL DRIVE GEAR BOX
TORQUE TUBE
UNIVERSAL SPLINED FITTING
TORQUE TUBE UNIVERSAL
D
FUSELAGE FITTING
E
QUICK DISCONNECT CHAIN
TORQUE TUBE
SPRING
GEAR BOX
BOOT
DRIVE SPROCKET
SPLINED SPROCKET COUPLING
30.30.27.021 A

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-39.

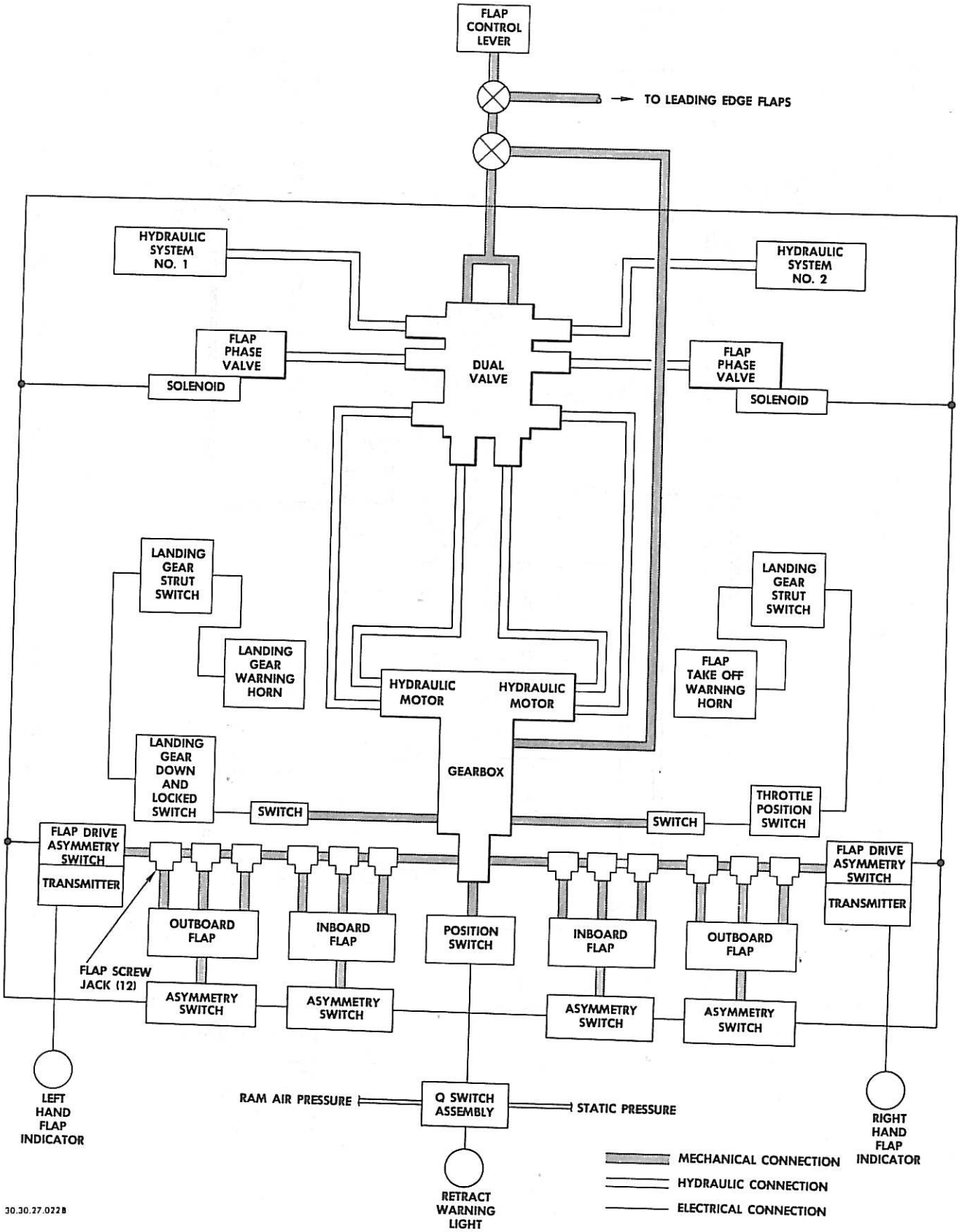
Insert facing 27-4-0, Page 1, dated Feb. 15/63 (or subsequent).

The instructions in this temporary revision are applicable to Group I airplanes. For Group II airplanes refer to instructions on 27-4-0, Page 1. For group designation refer to Manual INTRODUCTION.

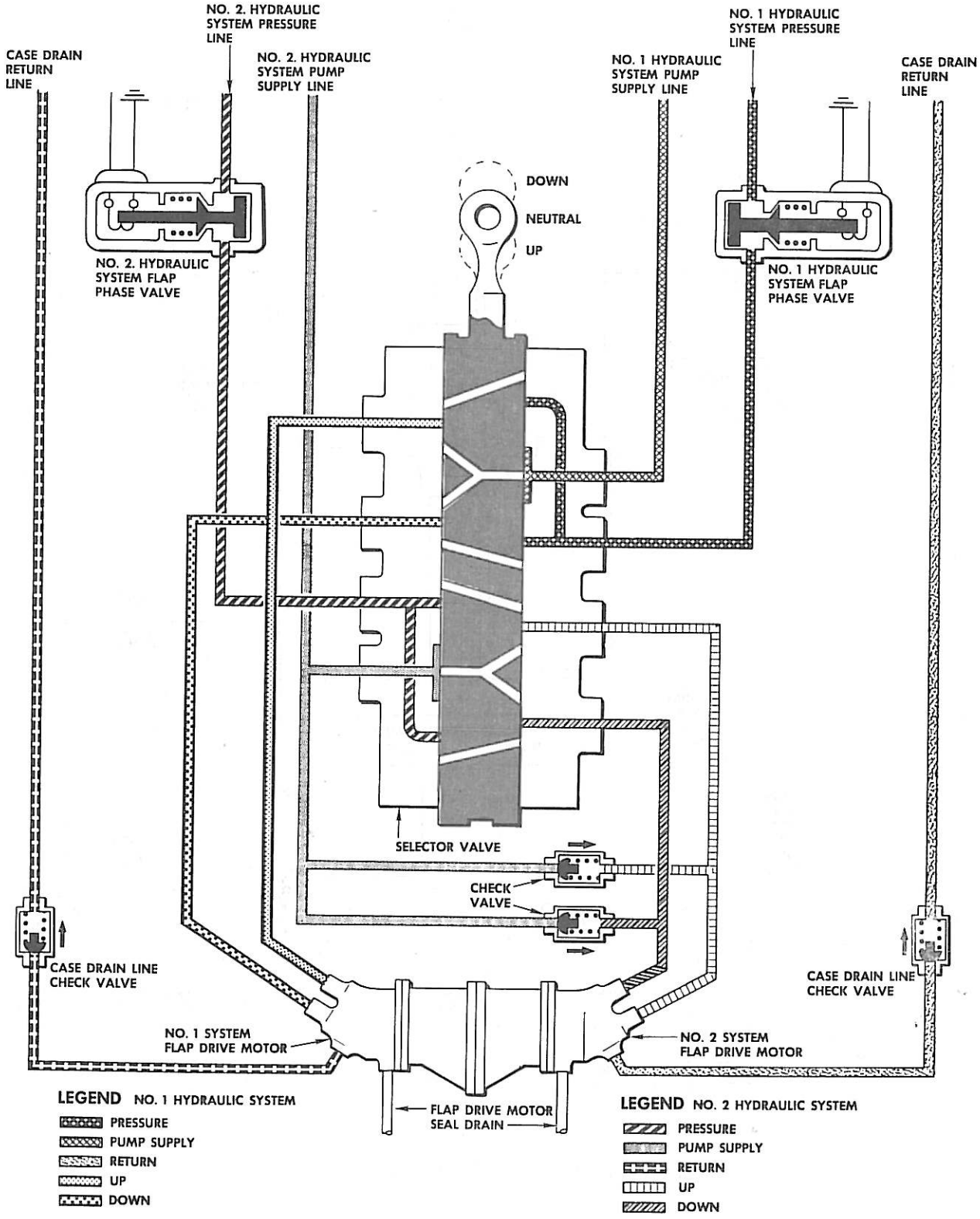
Retain this temporary revision until all applicable airplanes have been modified to Group II configuration.

Page 1, delete first paragraph and replace with the following:

The airplane is equipped with four Fowler-type wing trailing edge flaps, six leading edge flaps, and eight leading edge slats to increase the angle of attack at which the airplane stalls and reduce the distance required for takeoff and landing. The 18 extendible control surfaces are controlled simultaneously by means of a common control lever on the pilots' pedestal. The leading edge flaps and slats extend when trailing edge flaps have extended approximately 10 degrees. The trailing edge flaps and the leading edge flaps and slats are driven by hydraulic motors powered by the airplane's two hydraulic systems. For a complete description of the leading edge flap system, refer to 27-9-0.



Wing Flap Control System Schematic
Figure 2



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Wing Flap Hydraulic System Schematic
Figure 3

TEMPORARY REVISION NO. 27-15

Insert facing 27-4-0, Page 5, dated Aug. 27/62 (or subsequent).

The instructions on the noted facing page are to be used for all applicable airplanes except as follows: for airplanes not modified per Service Bulletin No. 27-3, substitute the following instructions where indicated.

Retain this Temporary Revision in your manual until all applicable airplanes have been modified per noted Service Bulletin.

Delete second paragraph on 27-4-0, Page 5, dated Aug. 27/62 and replace with the following:

The flap phase valves are also connected electrically to two rotating three-contact asymmetry switches, one mounted on the outboard screw jack actuator in each wing. These switches are connected in series and are timed so that the open contact in one of them is connected to a closed contact in the opposite switch (see Figure 4). If the flaps should get out of phase as much as approximately two degrees, the connected contacts in both switches will be closed simultaneously and energize a relay which allows the flap phase valves to close and stop the operating flap motor. A flap position transmitter is enclosed in each asymmetry switch housing.

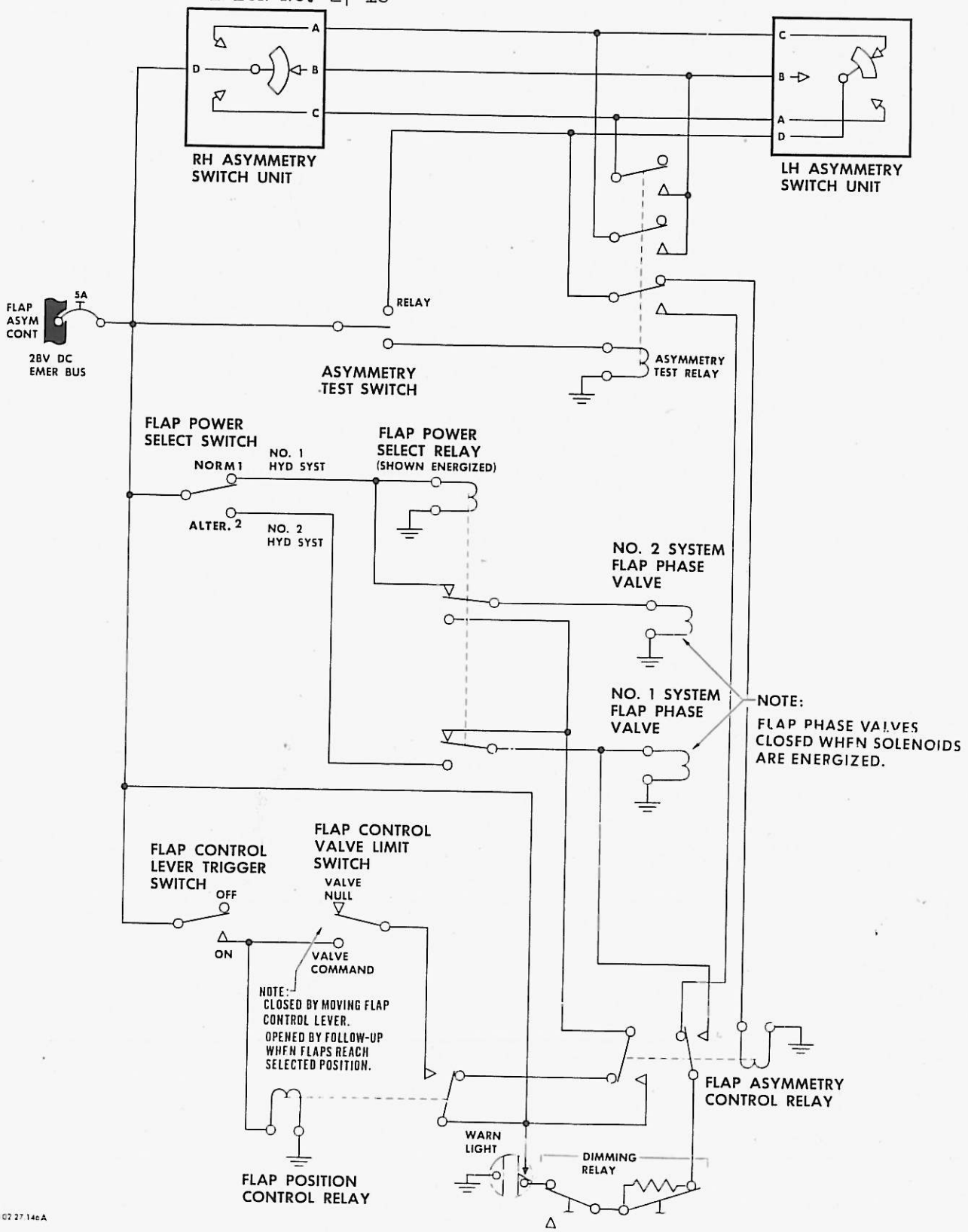
TEMPORARY REVISION NO. 27-16

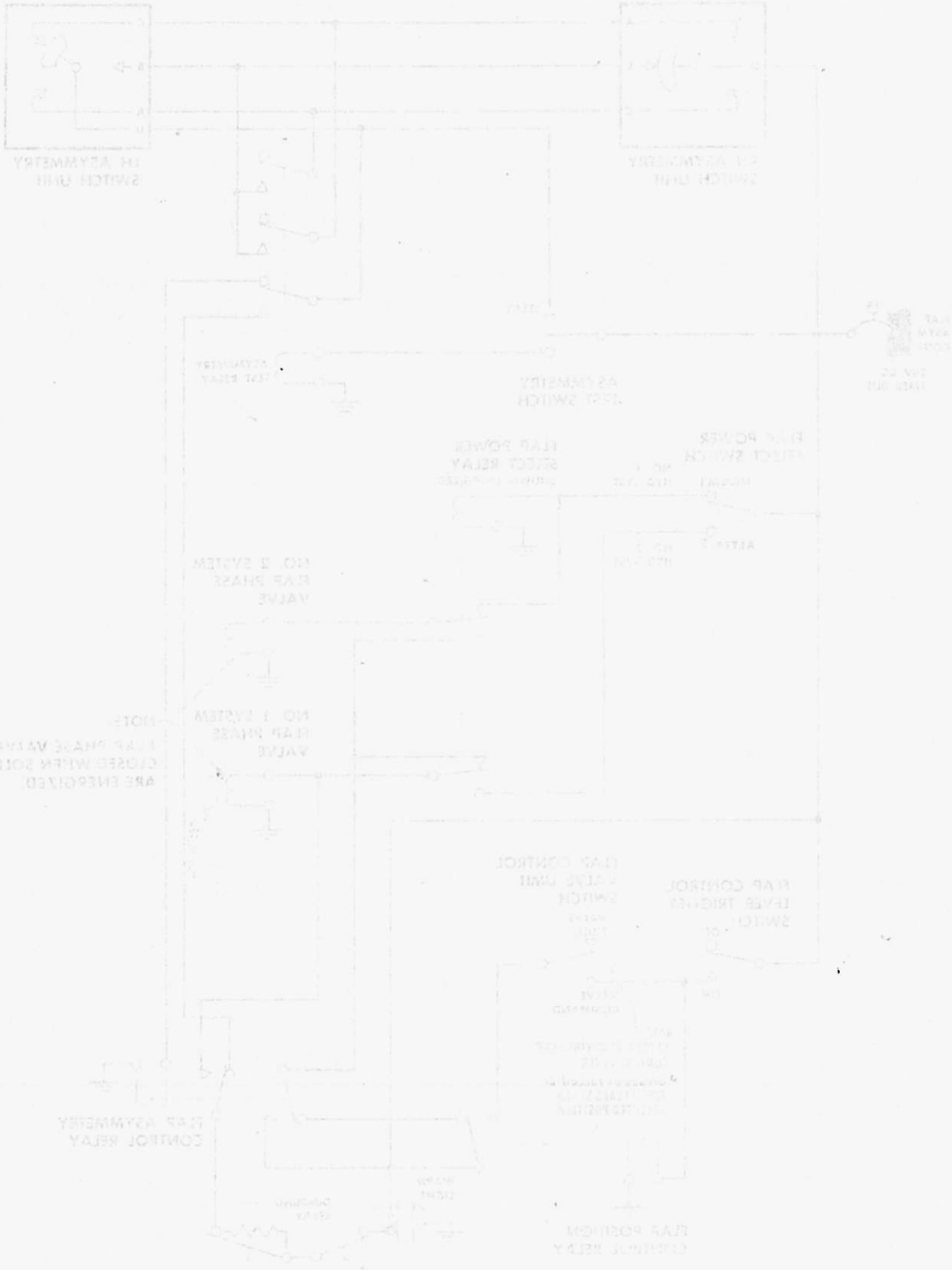
Insert facing 27-4-0, Page 6, dated Aug. 27/62 (or subsequent).

The illustration on sheet 2 of this temporary revision is to be used for airplanes not modified per Service Bulletin No. 27-3.

For airplanes that have been modified per Service Bulletin No. 27-3, use the illustration on 27-4-0, Page 6, dated Aug. 27/62.

Retain this Temporary Revision in your manual until all applicable airplanes have been modified per noted Service Bulletin.


A
D
B
C
RH ASYMMETRY SWITCH UNIT
C
B
A
D
LH ASYMMETRY SWITCH UNIT
FLAP ASYM CONT
5A
28V DC EMER BUS
RELAY
ASYMMETRY TEST SWITCH
ASYMMETRY TEST RELAY
FLAP POWER SELECT SWITCH
NORM 1
NO. 1 HYD SYST
ALTER. 2
NO. 2 HYD SYST
FLAP POWER SELECT RELAY (SHOWN ENERGIZED)
NO. 2 SYSTEM FLAP PHASE VALVE
NO. 1 SYSTEM FLAP PHASE VALVE
NOTE:
FLAP PHASE VALVES CLOSED WHEN SOLENOIDS ARE ENERGIZED.
FLAP CONTROL LEVER TRIGGER SWITCH
OFF
ON
FLAP CONTROL VALVE LIMIT SWITCH
VALVE NULL
VALVE COMMAND
NOTE:
CLOSED BY MOVING FLAP CONTROL LEVER.
OPENED BY FOLLOW-UP WHEN FLAPS REACH SELECTED POSITION.
FLAP ASYMMETRY CONTROL RELAY
WARN LIGHT
DIMMING RELAY
FLAP POSITION CONTROL RELAY
30 02 27 14eA



operating flap phase valve. The flaps will remain in the existing position until the discrepancy has been corrected. The FLAP ASYM CONT relay and flap asymmetry switch circuits are tested by actuating the FLAP ASYM switch to the SW TEST and REL TEST positions and checking that the FLAP ASYM light on the pilots' center instrument panel illuminates.

11. Flap Positon Indicator

The position of the flaps on each side of the airplane is indicated by a dual-pointer flap position indicator on the pilots' center instrument panel. The pointers are positioned by their associated flap position transmitters in the asymmetry switch assembly housing. The transmitters are driven through high-reduction worm gears by the shafts on which the asymmetry switch cams are mounted. The dial of the flap position indicator is calibrated from 0 to 50 degrees in 10-degree intervals.

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-17

Insert facing 27-4-0, Page 9, dated Aug. 27/62 (or subsequent).

The instructions in this temporary revision are to be used for airplanes not modified per Service Bulletin No. 27-3.

For airplanes that have been modified per Service Bulletin No. 27-3, use the instructions in paragraph 10 and 11 on 27-4-0, Pages 9 and 11, dated Aug. 27/62.

Retain this Temporary Revision in your manual until all applicable airplanes have been modified per noted Service Bulletin.

10. Asymmetry Switch and Flap Position Transmitter Units

An asymmetry switch assembly is mounted on the outboard support of the outboard jack screw actuator in each wing of the airplane. The "T" shaped housing of each assembly encloses an asymmetry switch unit and a flap position transmitter. The switch and transmitter units are driven by the splined drive shafts of the outboard jack screw actuators.

Each asymmetry unit consists essentially of three microswitches actuated by individual rollers riding on three rotating cams. The lobe on each cam keeps its associated switch closed for 124 degrees of cam rotation. The cams are mounted on a common shaft but are staggered so that one of the switches is always closed with three overlapping periods of four degrees during which two switches are closed (see Figure 4).

The two asymmetry units are connected in series in a circuit connecting the 28-volt dc essential bus to a flap asymmetry control relay. Energizing this relay completes a circuit which energizes and closes the operating flap phase valve. The three microswitches in each asymmetry switch unit are designated A, B, and C. The A switch in the left asymmetry switch unit is connected electrically to the C switch in the right asymmetry unit and the C switch in the left unit is connected to the A switch in the right unit. The B switches in both units are connected. The two asymmetry units are timed out of phase so that no two connected switches are closed at the same time.

If the flap system on one side of the airplane should jam, the flap torque tube and the asymmetry unit in the other wing will continue to turn until the switches in both asymmetry units come into phase and close the circuit from the bus to a flap asymmetry control relay. Energizing this relay completes a circuit which energizes and closes the

used to power the trailing edge flaps. When the FLAP PWR SELECT switch is in the NORMAL #1 position, the flap phase valve in the No. 2 hydraulic system is continuously energized closed and the flaps operate on the No. 1 hydraulic system only. If the No. 1 hydraulic system should malfunction, the FLAP PWR SELECT switch is moved to ALTERNATE #2, the No. 1 system flap phase valve is continuously energized to closed condition, and the flaps operate on the No. 2 hydraulic system only. The trailing edge flaps are never operated on both hydraulic systems at the same time.

The flap phase valves are also connected electrically to two three-contact rotating asymmetry switches driven by the flap drive torque tubes in the LH and RH wings and to four dual-switch assemblies, one located forward of the leading edge of each flap (see Figure 4). If the flap drive in one wing should break, the flaps will get out of phase, the electrical circuit through the flap drive asymmetry switches will be closed, and the phase valve in the operating hydraulic system will be energized to closed. Likewise, if a screw jack of one of the flaps should jam, the flap will be twisted, the electrical circuit through one of the individual flap asymmetry switches will be closed, and the phase valve in the operating hydraulic system will be energized to closed. Thus, any malfunction of the flap drive mechanism that results in unequal extension or retraction of the LH and RH flaps or that causes one of the flaps to become cocked will shut off the flow of hydraulic fluid to the flap motors and stop the flaps.

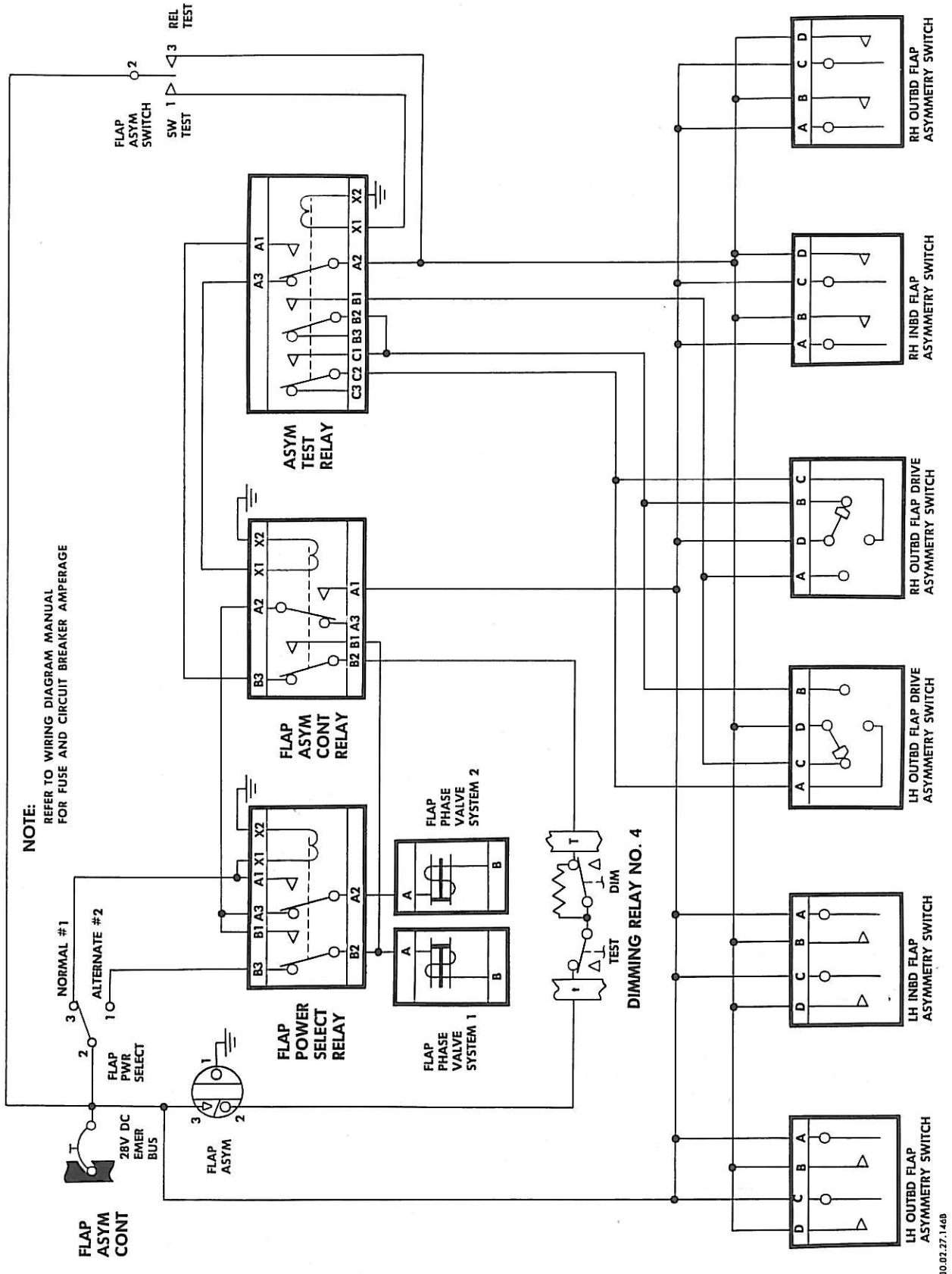
Actuating a FLAP ASYM switch on the pilots' pedestal to the SW TEST position illuminates a FLAP ASYM light on the pilots' instrument panel if the asymmetry switches are functioning properly. Actuating the FLAP ASYM switch to the REL TEST position illuminates the FLAP ASYM light if the FLAP ASYM CONT relay solenoid circuit is functioning properly.

Two flap position switches in the switch assembly mounted on the central drive gearbox are connected in the warning horn circuit. The warning horn will sound "1 second on - 1 second off" if two or more power levers are advanced to TAKEOFF position when the airplane is on the ground unless the flap control lever is set in the 10° or 27° detent. The warning horn will also sound "1 second on - 1 second off" during flight if the flaps are lowered 50 degrees with any landing gear unit not down and locked. Four "flap position vs airspeed" switches are also mounted in the switch assembly. These switches illuminate an ADJ FLAP light on the pilots' instrument panel when the flap setting exceeds the extension permitted for the existing airspeed.

2. Trailing Edge Flaps

There are two flaps on each wing, one outboard and the other inboard of the aileron. The flaps are supported by roller carriages which ride in steel double track assemblies bolted to the wing trailing edge structure. Each track assembly includes two curved tracks and two straight tracks.

The tracks are assembled so that the flap main carriage rides on the curved tracks and the straight tracks support the pivot carriage. The pivot carriage supports the flap actuator ball nut and the flap trunnion. A metal seal and a fabric air reservoir are installed in each flap track well in the upper surface of the wing trailing edge flap. The air reservoir is inflated by air passing over the lower side of the flap to bring the seal flush with



Flap Asymmetry Circuit
Figure 4

the flap upper surface when the flaps are lowered in flight. Refer to Chapter 57, WINGS, for a description of the flap structure. Each flap has a protruding leading edge separated from the main section of the flap by a narrow slot. When the flaps are partly lowered, the slots are exposed to the airflow beneath the wings. Some of this air passes through the slots to the upper surface of the flaps and increases their effectiveness. When the flaps are fully lowered, the space between the leading edge of each flap and the trailing edge of the wing serves as a second slot which augments the action of the slot in the flap. Seals along the lower trailing edge of the wing close the space between the flaps and the wing when the flaps are in the fully retracted position.

3. Flap Control Lever and Cable System

The flaps are operated by a flap control lever mounted on the right side of the pilots' pedestal. The flap lever assembly includes a flap lever, a lever quadrant with detents at the 0, 10, 27, 36, and 50-degree positions of flap travel, and a cable quadrant. Cables extend aft from the control lever cable quadrant to an aft cable quadrant with up and down stops to limit flap travel. A push-pull rod extends downward from the aft cable quadrant to the followup linkage which is connected to the flap selector valve on the central drive gearbox.

Before the flap control lever setting can be changed, the trigger-operated latch must be lifted from the detent in the lever quadrant. The latch and detents eliminate the possibility of the flap lever being moved accidentally or by feedback through the flap cable system.

4. Flap Central Drive Gearbox Assembly

The central drive gearbox assembly is mounted on the forward bulkhead of the hydraulic compartment immediately below the spoiler/speed brake mixer at fuselage station 964. This assembly includes two reversible hydraulic motors, a gear train, a dual three-position hydraulic selector valve, safety switches, and a followup mechanism. These components convert linear motion of the flap control lever on the pilots' pedestal into rotation of flap torque tubes to raise and lower the flaps to the selected position.

5. Flap Hydraulic Motors

Power to raise and lower the flaps is provided by two constant-displacement, piston type, hydraulic motors. One motor is mounted on each side of the aft end of the flap central drive gearbox. The motor on the right side of the flap drive gearbox is connected through the flap selector valve to the No.2 hydraulic system. In normal flap operation, the phase valve between this motor and hydraulic system No. 2 is maintained in the closed position. The motor on the left side of the gearbox is connected through the flap selector valve to the No. 1 hydraulic system. During normal flap operation this motor is used to drive the flaps.

The hydraulic motors drive the flap torque tubes through two sets of bevel gears with a gear reduction of approximately three to one. Two worm gears, forward of the torque tube gears, drive a followup crank and a cam to operate the safety switches.

Each hydraulic motor is connected to the flap selector valve by two hydraulic lines, either one of which serves as a pressure line depending on the direction in which the flaps are being removed. A case drain line returns hydraulic fluid from the case of the motor and a seal drain removes hydraulic fluid that may seep past the pump seals.

6. Flap Selector Valve

Flow of hydraulic fluid to the hydraulic motors is regulated by a dual three-position selector valve mounted on the bottom of the central drive gearbox. The selector valve is connected to the two hydraulic systems of the airplane by two pressure and two return hydraulic lines. Two additional hydraulic lines connect the selector valve to each hydraulic motor. Either of these lines may serve as the pressure or the return line depending on the setting of the selector valve.

The selector valve is actuated by an arm connected to the followup mechanism. When the valve arm is moved downward, the valve ports hydraulic fluid from the selected hydraulic system to the associated motor to drive it in the direction that will lower the flaps. When the valve arm is raised, the valve reverses the direction of fluid flow and the motor rotates in the opposite direction and raises the flaps. In the neutral position, the valve is closed and the flow of hydraulic fluid to the motor is cut off. A centering spring will keep the valve closed in case of control cable or linkage failure.

7. Followup Mechanism

The followup mechanism consists of a followup crank and a floating arm located on the right side of the central drive gearbox. The followup crank is driven by the gear train in the central drive gearbox through a worm gear with a high reduction ratio. Full flap travel of 50 degrees corresponds to a 50 degree rotation of the followup crank.

The forward end of the followup arm is connected to the push-pull rod that extends downward from the aft flap cable quadrant. The aft end of the followup arm is connected to the followup crank. The selector valve arm is connected to the center of the followup arm. When the flap control valve is moved to a new position, the forward end of the followup arm is raised or lowered by the push-pull rod, the crank end of the arm acts as a fulcrum, and the selector valve is opened. As the flaps move to the selected position, the followup crank rotates and raises or lowers the aft end of the followup arm, the push-pull rod end of the arm acts as a fulcrum, and the selector valve moves toward the closed position. When the followup crank has rotated to a position corresponding to the flap position selected by the flap control lever, the selector valve closes and shuts off the flow of hydraulic fluid to the operating flap motor.

A pointer attached to the followup arm is read against markings on the gearbox case to indicate the full-up and full-down position of the flaps.

8. Flap Torque Tube and Gearbox Assemblies

A torque tube extends outboard from each side of the central drive gearbox into the wing trailing edge aft of the rear spar (see Figure 1). Splined slip joints and universal joints between the torque tube sections provide for deflection and expansion and contraction of the tubes due to flexure of the wings. Splined sprocket couplings provide a quick disconnect for removing the torque tube sections. An angle gearbox is included in each torque tube assembly between the inboard and outboard flaps to change the torque tube routing to conform with the wing trailing edge break at the inboard ends of the ailerons.

A jack screw actuator in line with each jack screw assembly connects the torque tubes to the flap jack screws. Each actuator includes a bevel gear drive with a 1.625 to 1 reduction ratio and a "no-back" clutch (see Figure 5). The "no-back" clutch allows the torque tube to actuate the jack screw assembly but prevents aerodynamic loads on the flaps from rotating the torque tubes.

9. Flap Actuator Assemblies

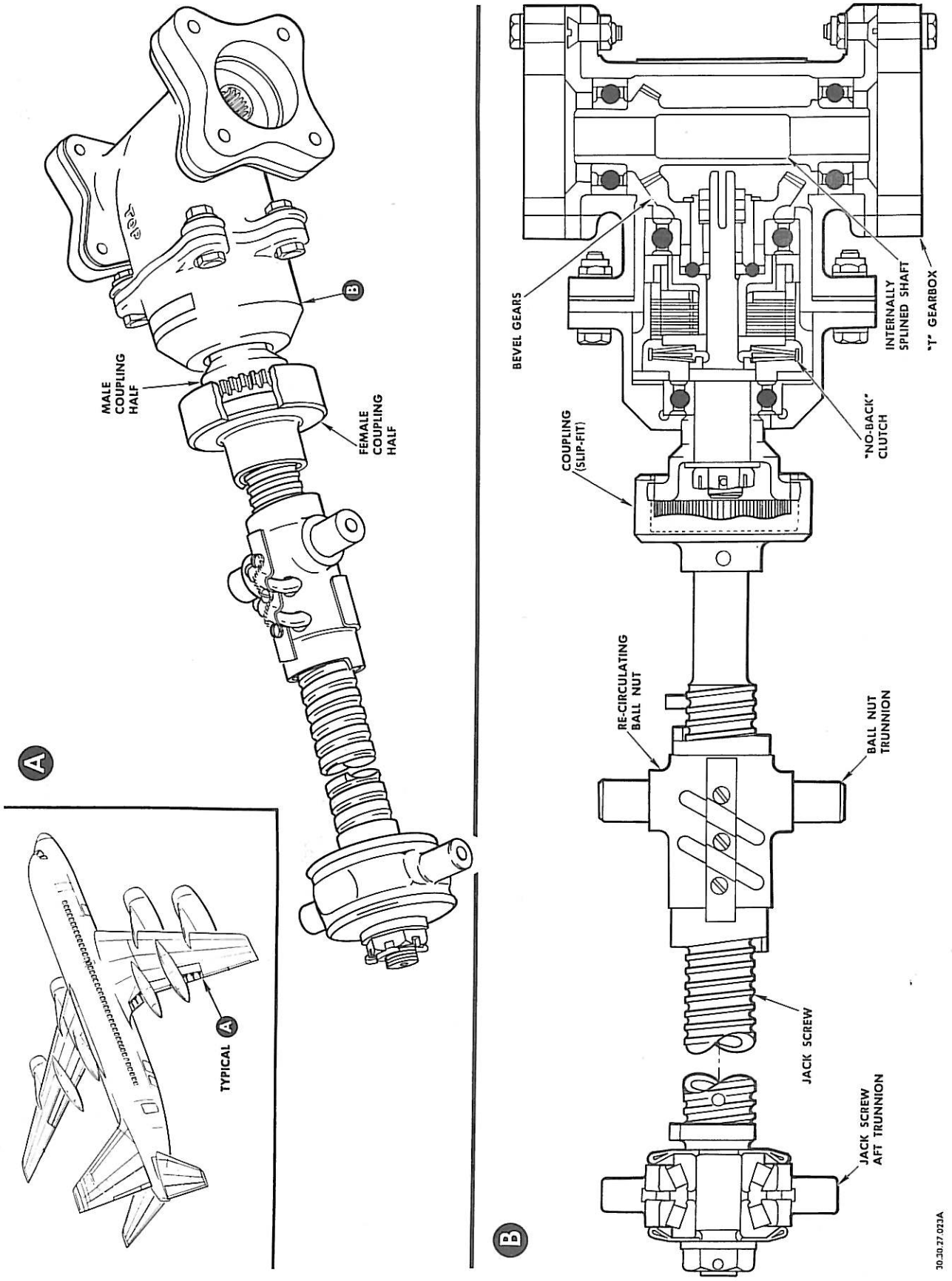
An actuator assembly is located between each pair of flap tracks. Each actuator assembly includes a jack screw driven by an actuator and a ball nut with recirculating ball bearings. When the jack screw is rotated, the ball nut travels back and forth on the jack screw moving the flap to a new setting. A notch in the forward end of each ball nut and a stop protruding from the jack screw constitute an emergency stop in the raised position of the flaps. A similar notch on the aft end of the ball nut and a dog at the aft end of the screw jack act as an emergency stop in the lowered position.

10. Flap Asymmetry Switches and Flap Position Transmitters

The flap system is protected against mechanical malfunction by two flap drive asymmetry switches and four individual flap asymmetry switch units. These switches are connected electrically through a relay with the flap motors and stop the flaps in case of a malfunction.

A flap drive asymmetry switch assembly is mounted on the outboard support of the outboard screw jack actuator in each wing of the airplane. The "T" shaped housing of each assembly encloses an asymmetry switch unit and a flap position transmitter. The switch and transmitter units are driven by the splined drive shafts of the outboard screw jack actuators of the outboard flaps. Each flap individual asymmetry switch unit is mounted in the wing trailing edge near the center of the associated flap and is driven by two cables, one attached to each end of the flap leading edge.

Each flap drive asymmetry unit consists essentially of three microswitches actuated by individual rollers riding on three rotating cams. The lobe on each cam keeps its associated switch closed for 124 degrees of cam rotation. The cams are mounted on a common shaft but are staggered so that one of the switches is always closed with three overlapping periods of four degrees during which two switches are closed (see Figure 4).



Flap Actuator Assembly
Figure 5

The two flap drive asymmetry units are timed out of phase so that no two connected switches are closed at the same time as long as the torque tubes in both wings continue to rotate at the same speed.

The housing of each individual flap asymmetry switch encloses two spring-loaded cable drums interconnected by a pendulum-mounted spur gear/cam unit and two electrical switches. The actuating roller of each switch rides on one of the tracks of the double track cam adjacent to a single cam lobe. During normal operation, the switch cables rotate the two drums in each unit in opposite directions at a uniform rate, the pendulum-mounted spur gear/cam unit remains in the same position, the switch rollers are in line with the flats, and both switches are open. If a flap screw jack should jam and the flap become cocked, the asymmetry switch cables will rotate the cable drums unevenly, the spur gear/cam unit will swing to one side, and one of the cam lobes will raise the associated switch roller and close the switch.

The two flap drive asymmetry switches are connected in series but this pair of switches and the separate switches in the individual flap asymmetry switch units are connected in parallel with the FLAP ASYM CONT relay With this arrangement, any malfunction that causes the flap drive torque tubes in the LH and RH wings to rotate at different speeds or results in the LH and RH ends of any flap extending or retracting at a different rate will close one of the asymmetry switches, energizing the flap phase valve in the operating hydraulic system to the closed position, stopping the flaps. The flaps will remain in the existing position until the discrepancy has been corrected.

The flap asymmetry electrical circuits and the FLAP ASYM CONT relay are tested by actuating the FLAP ASYM switch on the pilots' pedestal to the SW TEST and REL TEST positions and checking that the FLAP ASYM light on the pilots' center panel illuminates.

11. Flap Position Indicator

The position of the flaps on each side of the airplane is indicated by a dual-pointer flap position indicator on the pilots' center instrument panel. The pointers are positioned by their associated flap position transmitters in the asymmetry switch assembly housing. The transmitters are driven through high-reduction worm gears by the shafts on which the asymmetry switch cams are mounted. The dial of the flap position indicator is calibrated from 0 to 50 degrees in 10-degree intervals.

12. Flap Safety Switch Assembly

A safety switch assembly is mounted on the left side of the flap central drive gearbox. This assembly includes a double-track cam and roller-actuated microswitches. A flap position takeoff warning switch and a flap position landing warning switch are connected in the warning horn circuit. In addition, four flap position vs air speed warning switches are included in the assembly. The shaft on which the cam is mounted is driven through a range of 90 degrees by the drive shaft that actuates the followup crank on the opposite side of the central drive gearbox. The

gear ratios in the flap drive system are such that a flap deflection of 50 degrees corresponds to approximately 90 degrees of safety switch cam rotation, 50 degrees of followup crank rotation, and 220 revolutions of the flap torque tubes.

The warning horn flap switches are positioned in relation to the cam so that the takeoff switch is open when the flap control lever is set in the 10-degree detent. The landing switch is positioned to close when the flaps approach 50 degrees. During takeoff, the warning horn will sound "one second on - one second off" if the flaps or the stabilizer are not in the correct takeoff position. During flight, the warning horn will sound continuously if the flaps are lowered to 50 degrees when one or more of the landing gear units are not down and locked. A schematic diagram showing the warning horn circuits appears in Figure 6. Refer to 27-6-0, Figure 10 for a schematic diagram of the "stabilizer not in takeoff position" circuits.

A placard on the copilot's console lists the maximum permissible airspeed for flap extension positions of 10, 36, and 50 degrees and is considered part of the warning system. Refer to 27-0, Figure 6 for a block diagram of the warning horn function.

13. Flap Position VS Airspeed Warning Switches

Four flap position switches in the switchbox located on the LH side of the flap central drive gearbox illuminate a light on the center instrument panel when airspeed exceeds the placarded value for the current flap setting. *Flap position switch No. 2 (24 degree flap) is also used to delay retraction of wing leading edge outboard flaps until the trailing edge flaps have reached the 24 degree position. A schematic representation of this circuit appears on Figure 6.

*Applicable to all Group II airplanes, except airplanes CV26 through CV34 (refer to Manual INTRODUCTION for explanation of group designations). Also applicable to airplanes CV26 through CV34 after incorporating either Service Bulletin No. 27-45 or No. 51-1 (Ammendment No. 13).

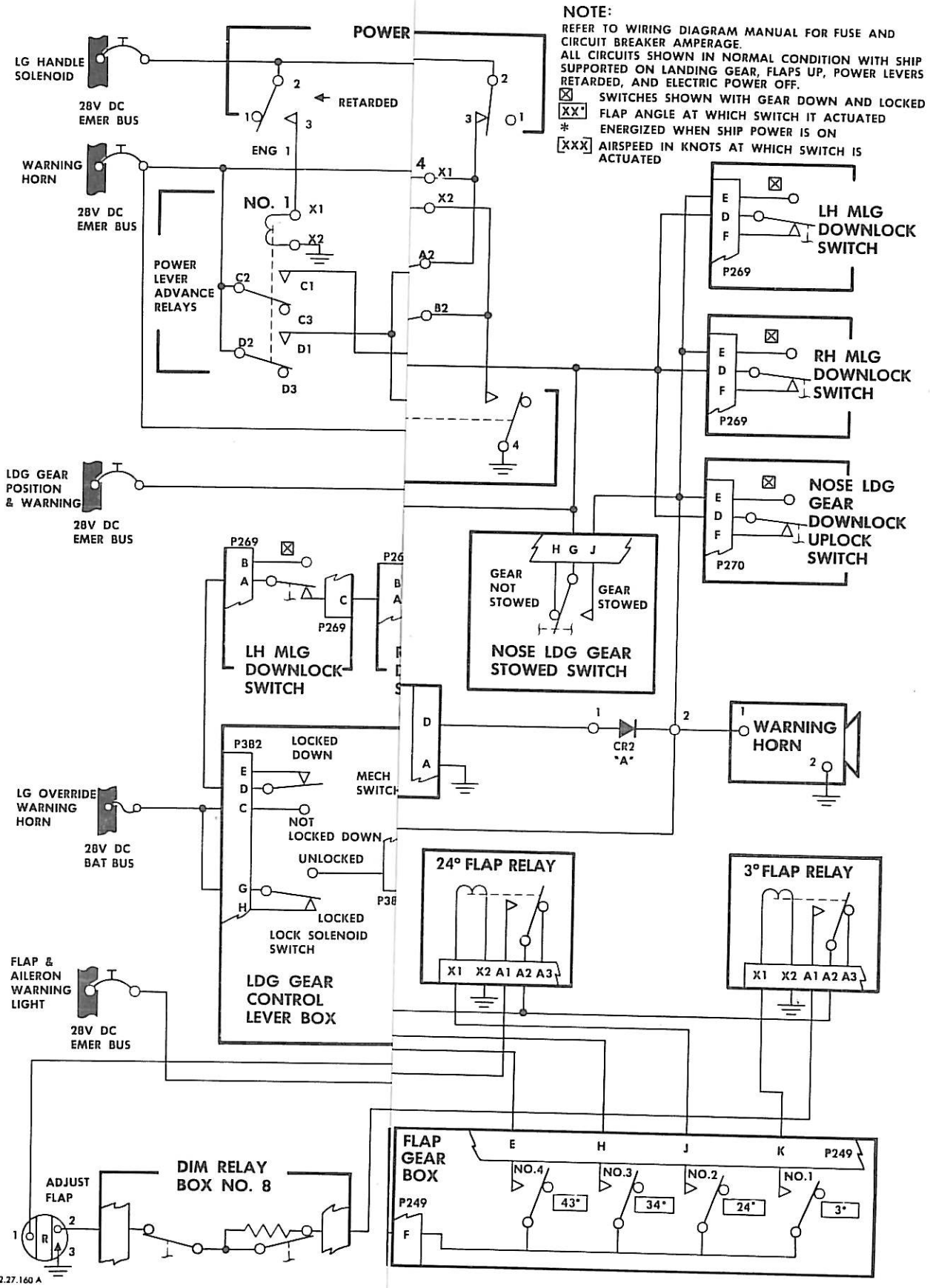
TEMPORARY REVISION NO. 27-95.

Insert facing 27-4-0, Page 13, dated Sep. 25/63 (or subsequent date).

The instructions in this temporary revision are applicable to Group I airplanes. For Group II airplanes, use the information on 27-4-0, Page 13. (Refer to Manual INTRODUCTION for explanation of group designations.)

Retain this temporary revision in your manual until applicable airplanes have been modified to Group II configuration.

Page 13, delete the 3 degree, 24 degree, 34 degree and 43 degree flap relays from flap and aileron warning circuit. (The airspeed warning control switches in the flap gear box are connected directly to the flap angle position switches in the airspeed warning control.)



ning Horn Circuit
Figure 6

FLAP CONTROL SYSTEM - TROUBLE SHOOTING

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
1. TRAILING EDGE FLAPS INOPERATIVE	
A. Faulty linkage between control lever and flap selector valve.	On right-hand side of central drive gearbox, disconnect flap selector valve push-pull rod from selector valve actuating arm. Move flap control lever on pilots' pedestal and check for proper movement of followup mechanism arm on side of central drive gearbox. If travel is not satisfactory, check for broken control cable or faulty linkage and correct. If travel of followup mechanism arm is satisfactory, reconnect linkage without changing length of push-pull rod, and disconnect inboard torque tube on each side of central drive gearbox (refer to 27-4-11, Removal/Installation Flap Drive Torque Tubes). Connect external source of ac electrical power (refer to Chapter 24, ELECTRICAL POWER). Pressurize airplane hydraulic system No.1 (refer to Chapter 29, HYDRAULIC POWER). Move FLAP PWR SELECT switch to NORMAL #1 position. Close FLAP ASYM CONT circuit breaker. Move flap control lever and check for rotation of flap drive on each side of flap central drive gearbox. If no rotation, replace central drive gearbox. If flap drive rotates on each side of central drive gearbox, depressurize hydraulic system (refer to Chapter 12, SERVICING) and hand rotate each disconnected inboard torque tube. Note movement of flap as each torque tube is rotated. If torque tube rotates but flap does not move, section of flap drive torque tube is broken. Replace broken section (refer to 27-4-11, Removal/Installation Flap Drive Torque Tubes).

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
1. TRAILING EDGE FLAPS INOPERATIVE (CONT)	
B. Inoperative actuator.	If either torque tube cannot be rotated by hand, an inoperative actuator is indicated. Beginning with inboard actuator, disconnect torque tube from outboard side of actuator and hand rotate inboard drive of actuator. If outboard drive of actuator rotates, actuator is operative. Check each actuator until inoperative actuator is located. When inoperative actuator is located, remove actuator jack screw (refer to Removal/Installation Flap Actuator) and again attempt to rotate inboard drive of actuator gearbox to determine whether jack screw or gearbox is inoperative. Replace inoperative unit.
C. Flaps out of symmetry.	Refer to trouble No. 2.
D. Phase valve does not open.	Refer to trouble No. 3.
2. TRAILING EDGE FLAP(S) OUT OF SYMMETRY (BEYOND LIMITS OF SWITCH ACTUATION) AND FLAP DRIVE MOTORS CONTINUE TO DRIVE FLAPS.	
A. Individual flap asymmetry switch drive cable(s) broken, or flap drive asymmetry switch drive shaft broken.	Check asymmetry switch drive cables and/or drive shafts. Repair or replace defective cables or drive shafts as required.
B. Power bus or circuit breaker for flap asymmetry circuit malfunctioning.	With power on, check for power through FLAP ASYM CONT circuit breaker on main circuit breaker panel. If no power, replace circuit breaker. If power still not available, trouble shoot 28-volt dc emergency bus (refer to Chapter 24, ELECTRICAL POWER).

TEMPORARY REVISION NO. 27-94

Insert facing 27-4-0, Page 102, dated Sep. 25/63 (or subsequent).

The instructions in this temporary revision are applicable to airplanes not modified per Service Bulletin 27-3. For airplanes modified per Service Bulletin 27-3, use the instructions in step 2. beginning on 27-4-0, page 102.

Retain this temporary revision in your manual until all applicable airplanes have been modified per noted service bulletin.

Page 102, delete step 2. on pages 102, 103 and 104 and substitute the following:

2. TRAILING EDGE FLAPS OUT OF SYMMETRY MORE THAN 3.3 DEGREES AND FLAP DRIVE MOTORS CONTINUE TO DRIVE FLAPS

A. Faulty flap asymmetry circuit.	With power at the 28-volt dc emergency bus, check for power through FLAP ASYM CONT circuit breaker on main circuit breaker panel. If no power, replace circuit breaker. If power through FLAP ASYM CONT circuit breaker, open circuit breaker and proceed as follows: Check continuity between circuit breaker and terminal D of RH asymmetry switch. If no continuity, correct circuit. If continuity, remove RH switch from mount and disconnect electrical plug. Rotate switch spline and check continuity between pins D and A, D and B, and D and C. (Refer to Removal/Installation Flap Drive Asymmetry Switch Assembly.) If continuity not present between any two terminals checked, replace asymmetry switch.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
2. TRAILING EDGE FLAPS OUT OF SYMMETRY MORE THAN 3.3 DEGREES AND FLAP DRIVE MOTORS CONTINUE TO DRIVE FLAPS (CONT)	
	If continuity between all terminals, reinstall RH asymmetry switch (refer to 27-3-12, Removal/Installation Flap Drive Asymmetry Switch Assembly. Check continuity between RH and LH Asymmetry switches. If continuity not present, correct circuit.
	If continuity present at each terminal of LH asymmetry switch, remove switch and check continuity through switch using same procedure given for RH switch. If no continuity between any two terminals checked, replace asymmetry switch.
	If continuity between all terminals, reinstall LH asymmetry switch and check continuity between terminal D on LH switch and terminal X_1 of flap asymmetry control relay. If no continuity, correct circuit.
	If continuity to flap asymmetry control relay, check resistance between relay terminals X_1 and X_2. If faulty, replace relay.
	NOTE: Relay and valve coil resistances should be between 50 and 500 ohms.
	If resistance between terminals X_1 and X_2, check continuity from terminal X_2 to ground. If faulty, correct circuit.
	If continuity from 28 volt dc emergency bus to ground of coil in flap asymmetry control relay, check continuity from connector in wire from FLAP ASYM CONT circuit breaker to terminal A3 of flap asymmetry control relay. If no continuity, correct circuit.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
2. TRAILING EDGE FLAPS OUT OF SYMMETRY MORE THAN 3.3 DEGREES AND FLAP DRIVE MOTORS CONTINUE TO DRIVE FLAPS (CONT)	
	Check continuity between terminal A_2 on flap asymmetry control relay and terminals A on each flap phase valve. If no continuity on either check, correct circuit.
	If continuity to terminal A on each flap phase valve, check resistance between terminals A and B on each valve. If faulty on either valve, replace faulty valve.
	If resistance between terminals A and B on each flap phase valve, check continuity from terminals B on each valve to ground. If faulty, correct circuit.
	If continuity between terminal B and ground on each flap phase valve, replace flap asymmetry control relay.
	Close FLAP ASYM CONT circuit breaker on main circuit breaker panel and remove warning sign.
	If either flap drive motor continues to operate with flaps out of symmetry, replace the applicable flap phase valve.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
2. TRAILING EDGE FLAPS OUT OF SYMMETRY MORE THAN 3.3 DEGREES AND FLAP DRIVE MOTORS CONTINUE TO DRIVE FLAPS (CONT)	
	Check continuity between terminal Ag on flap asymmetry control relay and terminals A on each flap phase valve. If no continuity on either check, correct circuit.
	If continuity to terminal A on each flap phase valve, check resistance between terminals A and B on each valve. If fault on either valve, replace fault valve.
	If resistance between terminals A and B on each flap phase valve, check continuity from terminals B on each valve to ground. If faulty, correct circuit.
	If continuity between terminal B and ground on each flap phase valve, replace flap asymmetry control relay.
	Close FLAP ASYM CONT circuit breaker on main circuit breaker panel and remove warning sign.
	If either flap drive motor continues to operate with flaps out of asymmetry, replace the applicable flap phase valve.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
2. TRAILING EDGE FLAP(S) OUT OF SYMMETRY (BEYOND LIMITS OF SWITCH ACTUATOR) AND FLAP DRIVE MOTORS CONTINUE TO DRIVE FLAPS (CONT)	
C. Asymmetry test relay (K-273), flap asymmetry control relay (K-125) or flap power select relay (K-274) defective.	Open FLAP ASYM CONT circuit breaker and check for continuity between terminals A2 and A3 of relay K-273. If no continuity, replace relay K-273. If continuity present, check for continuity from A3 of relay K-273 to X1 of relay K-125. If continuity not present, repair or replace airplane wiring as required. If ok, check for continuity through coil to ground of relay K-125; replace relay K-125 if continuity not present. If ok, check for continuity between terminals A1 and A2 of relay K-125; if continuity present, relay contacts defective; replace relay. Check for continuity between terminal A2 of relay K-125 and terminal B1 and/or A3 of relay K-274. If no continuity repair or replace wiring as required. If continuity present, check for continuity between terminals A3 and A2, and B1 and B2 of K-274. Continuity should exist between terminals A3 and A2, but not between B1 and B2; replace K-274 if continuity check indicates faulty contacts in relay. If relay K-274 ok, check for continuity from terminal B2 of K-274 to terminal A of flap phase valve (system #1) solenoid, and from A2 of K-274 to terminal A of flap phase valve (system #2) solenoid. Repair or replace wiring as required if continuity not present.
D. Flap phase valve(s) solenoid malfunctioning, or valve defective.	Check for continuity between terminals A and B of flap phase valve solenoids; replace phase valve if continuity not present through solenoid coil. If ok, check for continuity from terminal B of each solenoid to ground; repair or replace wiring as required if no continuity.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
2. TRAILING EDGE FLAP(S) OUT OF SYMMETRY (BEYOND LIMITS OF SWITCH ACTUATOR) AND FLAP DRIVE MOTORS CONTINUE TO DRIVE FLAPS (CONT)	
E. Individual flap asymmetry switch malfunctioning or connecting circuitry defective.	Pull individual flap asymmetry switch cable until approximately 0.75 to 1.0 inch of cable is pulled from switch. Check for continuity between terminals C and D, and A and B. If no continuity replace switch. If continuity through switch, check for continuity from terminals D and/or B of individual flap asymmetry switch to terminal A2 of relay K-273. If no continuity, repair or replace wiring as required between switch and relay. If continuity, check for continuity from FLAP ASYM CONT circuit breaker to terminals C and A of asymmetry switch. Repair or replace wiring as required if continuity not present. Repeat above procedure for each individual flap asymmetry switch suspected of faulty operation.
F. Flap drive asymmetry switch malfunctioning, or associated circuitry defective.	Check for continuity between FLAP ASYM circuit breaker and terminal D of RH flap drive asymmetry switch; if no continuity, repair or replace wiring as required. If continuity, disconnect electrical plug from RH switch and remove switch from its mount (refer to Removal/Installation Flap Drive Asymmetry Switch Assembly). Rotate switch splined shaft and check continuity between pins D and A, D and B, and D and C. If continuity not present between any two terminals checked, replace asymmetry switch. If continuity is present between all terminals, reinstall RH asymmetry switch (refer to Removal/Installation Flap Drive Asymmetry Switch Assembly). Check continuity between RH and LH asymmetry switches. If continuity not present, repair or replace wiring as required to correct circuit.

POSSIBLE CAUSE	ISOLATION PROCEDURE AND CORRECTION
2. TRAILING EDGE FLAP(S) OUT OF SYMMETRY (BEYOND LIMITS OF SWITCH ACTUATOR AND FLAP DRIVE MOTORS CONTINUE TO DRIVE FLAPS (CONT)	If continuity is present at each terminal of LH asymmetry switch, remove LH switch and check continuity through switch using same procedure given for RH switch. If no continuity between any two terminals checked, replace asymmetry switch. If continuity is present between all terminals reinstall LH asymmetry switch and check continuity between terminal D of LH switch and terminal A2 of relay K-273. If no continuity, repair wiring as required.

FLAP CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Adjustment/Test Flap Control System Rigging Procedure (see Figure 201)

A. Equipment Required.

(1) External source of hydraulic power.

(2) External source of electrical power.

(3) Four 0.70-inch spacer blocks for adjusting flap travel.

(4) A shop-fabricated "Go" gage (30-40005-903), one end to measure minimum gap of two screw jack turns or 0.58 inch between aft ball nut stop and aft screw jack stop, the other end to measure gap of 1.143 inches between forward axle of pivot carriage and housing of screw jack actuator or coupling.

(5) Standard cable tensiometer.

(6) Thermometer.

(7) Index pin (3/16-inch diameter) for checking leading edge flap control pulley rigging.

(8) Protractor No. 22-18000-901 for measuring travel of LH inboard flap (see Figure 202).

(9) Dial indicator with shop-fabricated base for measuring flap screw jack movement.

(10) Torque wrench calibrated in inch-pounds.

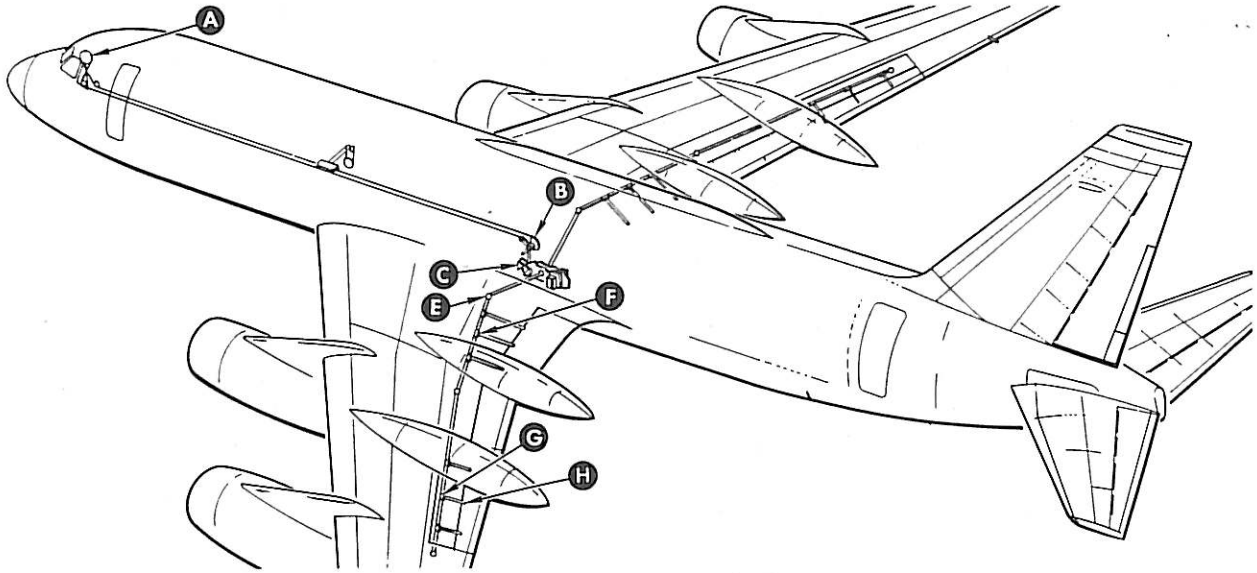
B. Adjust Flaps.

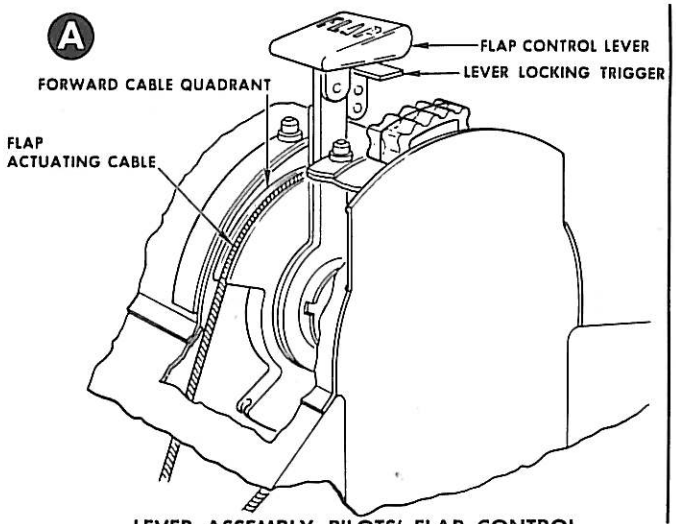
CAUTION: MAKE CERTAIN THAT BOTH HYDRAULIC SYSTEMS ARE DEPRESSURIZED AND THAT ELECTRIC POWER IS OFF.

(1) Disconnect lower end of aft cable quadrant push-pull rod.

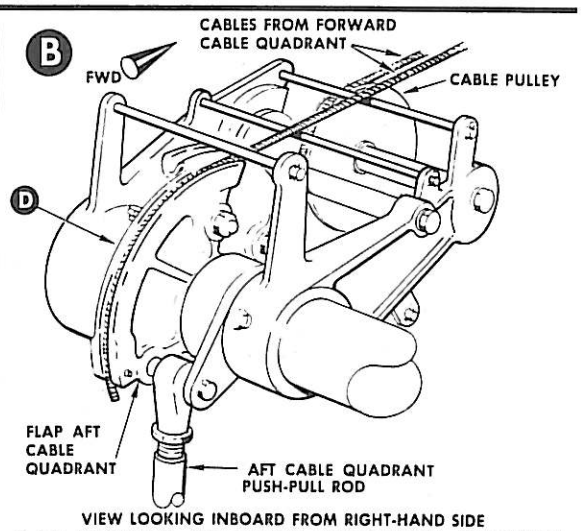
(2) Adjust flap fuselage cable tension to 50 (±5) pounds at 70 degrees F (21 degrees C). Increase or decrease specified cable tension 0.25 pounds for each degree F (0.50 pounds for each degree C) increase or decrease respectively in free air temperature.

(3) Adjust flap cable system so that aft cable quadrant "up flap" stop contacts flap control fixed stop when flap control lever is in the 0° detent and "down flap" stop contacts the fixed stop when flap control lever is in 50° detent and cable tension is within specified tolerance.

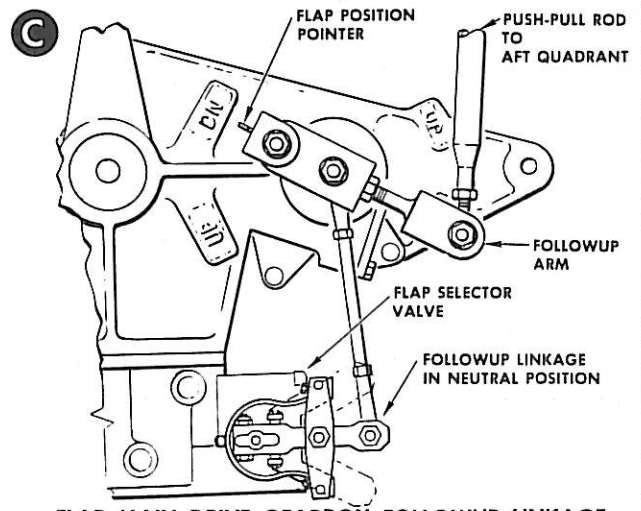




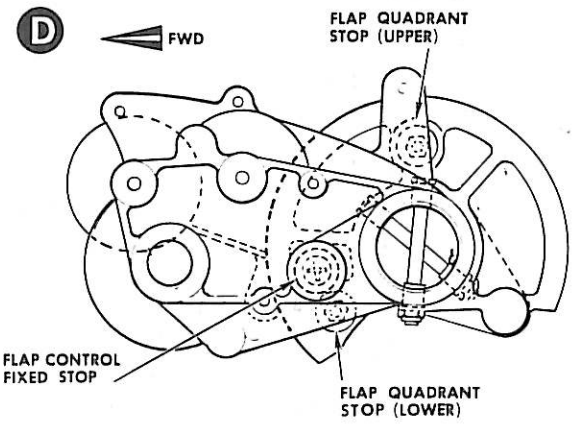
LEVER ASSEMBLY-PILOTS' FLAP CONTROL



FLAP CONTROL-AFT CABLE QUADRANT ASSEMBLY

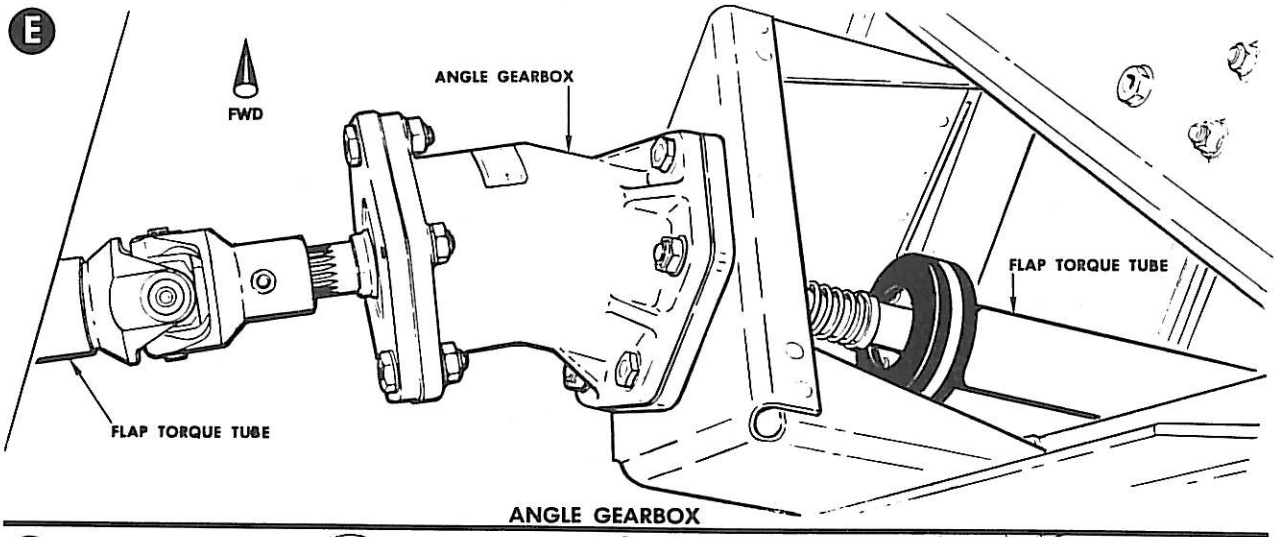


FLAP MAIN DRIVE GEARBOX FOLLOWUP LINKAGE

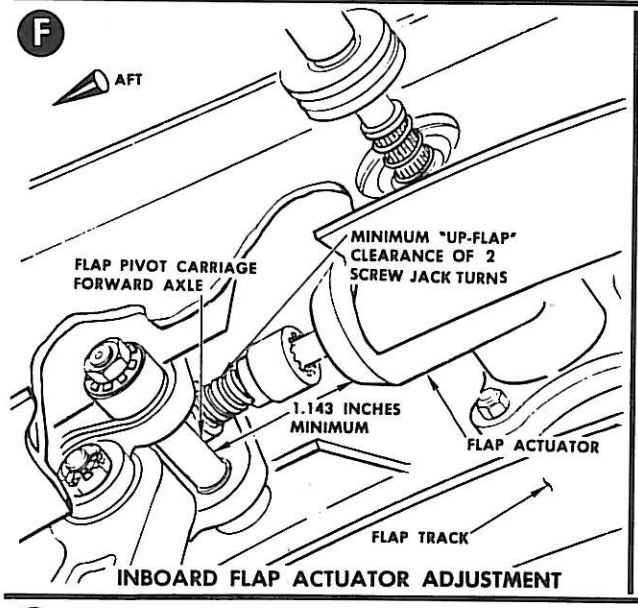


QUADRANT SHOWN IN FLAP UP POSITION

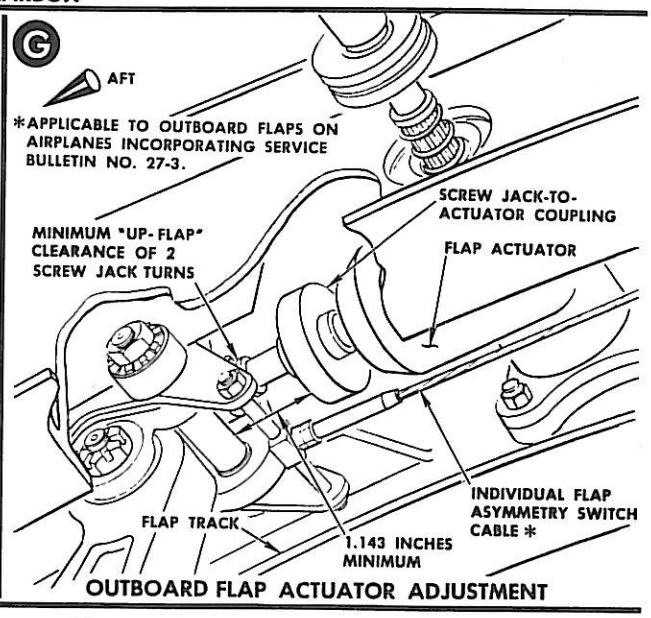
30.02.27.154-1 A



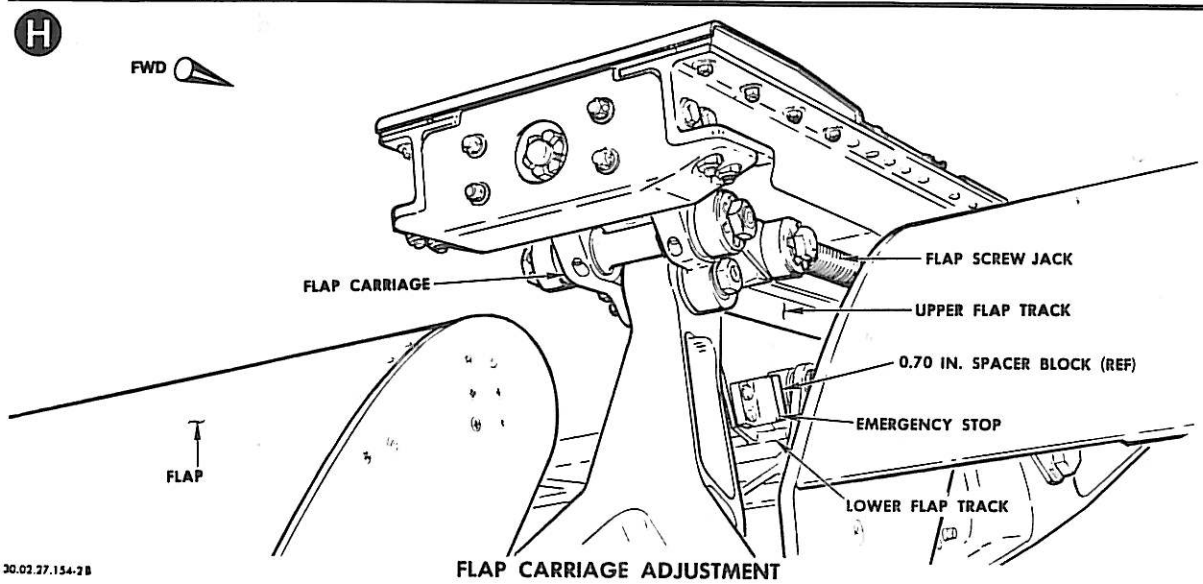
ANGLE GEARBOX



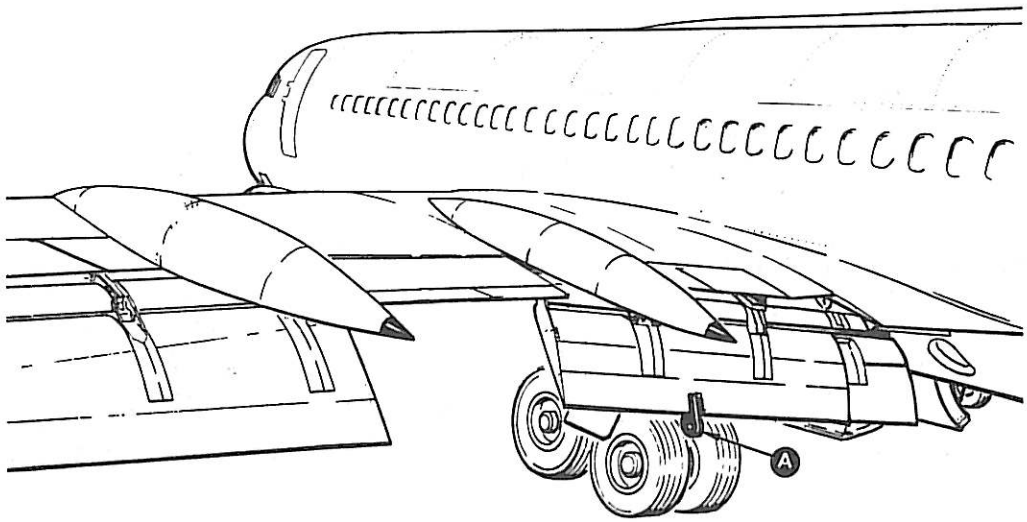
INBOARD FLAP ACTUATOR ADJUSTMENT



OUTBOARD FLAP ACTUATOR ADJUSTMENT



FLAP CARRIAGE ADJUSTMENT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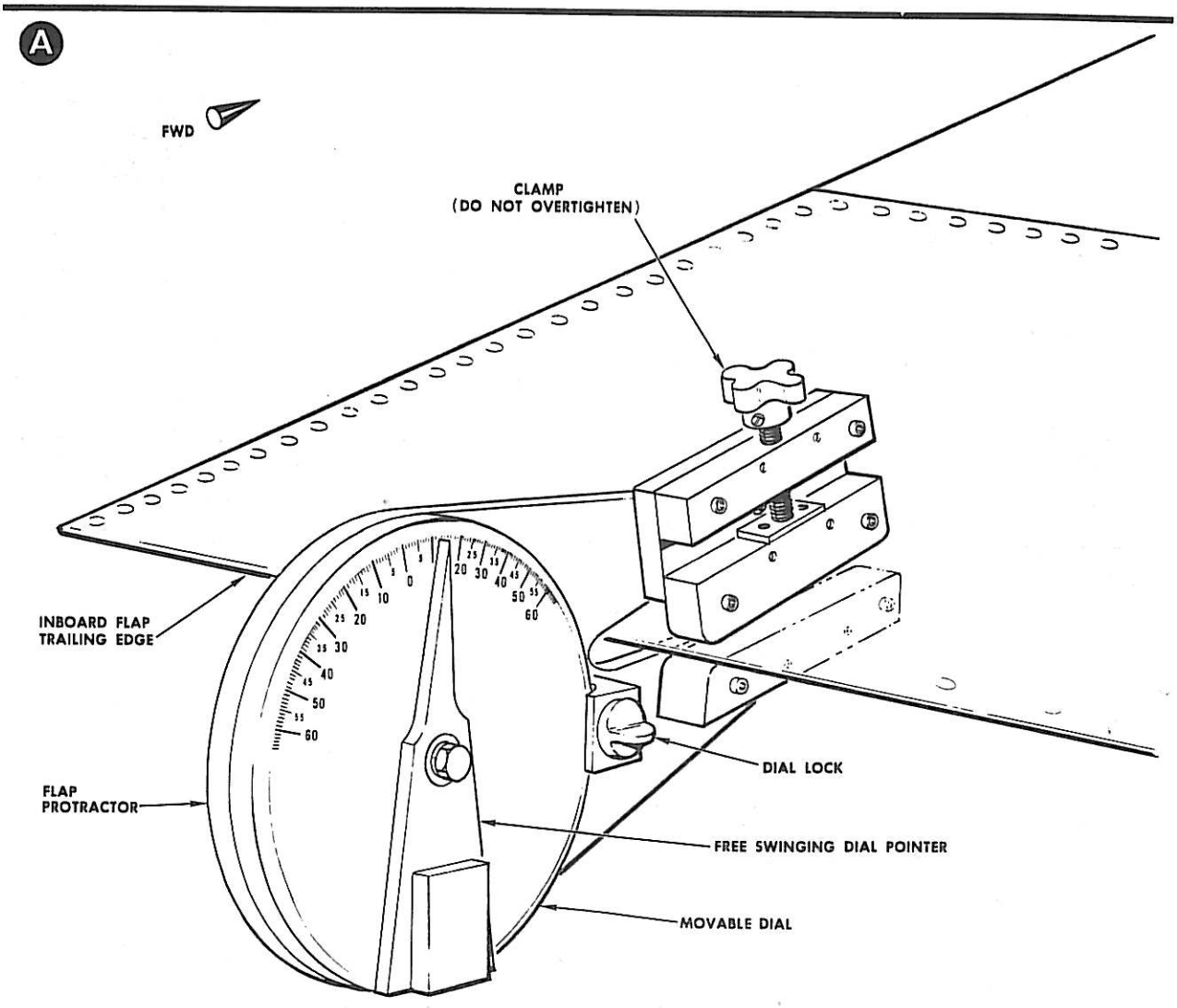

A
FWD
CLAMP
(DO NOT OVERTIGHTEN)
INBOARD FLAP
TRAILING EDGE
FLAP
PROTRACTOR
DIAL LOCK
FREE SWINGING DIAL POINTER
MOVABLE DIAL

30.02.27.153A

TEMPORARY REVISION NO. 27-24.

Insert facing 27-4-0, Page 204, dated Oct. 15/62 (or subsequent).

This temporary revision is applicable to Group I airplanes (refer to Manual INTRODUCTION for explanation of group designations).

For Group II airplanes use the information on 27-4-0, Page 204.

Page 204, insert the following note after Step (12).

NOTE: With FLAP PWR SELECT switch in NORMAL #1 position, flaps are driven only by the No. 1 hydraulic system. However, since the leading edge flaps and slats operate simultaneously with the wing flaps, both hydraulic systems should be pressurized to prevent cavitation in system No. 2 leading edge flap and slat drive motor.

NOTE: After cable adjustment, index pin must be easily inserted in leading edge flap control pulley (station 656) with flap control lever in 0° detent.

(4) Position flap control lever in 0° detent and check that lever does not touch forward end of flap control lever slot in pedestal housing.

(5) Position flap control lever in 50° detent and check that lever does not touch aft end of flap control lever slot in pedestal housing.

(6) Change flap control quadrant stops as necessary to prevent flap control lever overtravel. Quadrant stops should make contact just before flap control lever reaches 0° or 50° detent so that slight stretching of the control cables will be required to put lever in either detent.

(7) Disconnect flap drive torque tubes from each side of the central drive gearbox (refer to Removal/Installation Flap Drive Torque Tubes).

(8) Rotate flap drive torque tubes manually to lower flaps. Install 0.70-inch spacer blocks between flap main carriage roller and emergency stop at end of track. Lower flaps against spacer blocks.

(9) Deleted.

(10) Rotate central drive gearbox output shaft to drive flap position pointer, on right side of central drive gearbox, to DN position. Install 0.125-inch index pin to center flap selector valve arm.

CAUTION: NEVER DRIVE FOLLOWUP ARM MORE THAN 0.20 INCH BEYOND "UP" OR "DN" PADS OR FOLLOWUP GEARS WILL BE STRIPPED.

(11) With flap control lever in 50° detent, adjust vertical push-pull rod to length between flap control quadrant and followup arm and connect rod. Remove index pin and 0.70-inch spacer blocks.

(12) Connect external source of electrical power, close FLAP ASYM CONT circuit breaker, and move FLAP PWR SELECT switch to NORMAL #1 position. Pressurize both airplane hydraulic systems (refer to Chapter 29, HYDRAULIC POWER). Set hydraulic power unit to deliver minimum flow.

CAUTION: DO NOT OPERATE FLAPS WHEN BOTH HYDRAULIC SYSTEMS ARE PRESSURIZED UNLESS ELECTRICAL POWER IS APPLIED TO THE AIRPLANE AND THE "FLAP ASYM CONT" CIRCUIT BREAKER IS CLOSED.

(13) Move flap control lever to 0° detent. Increase hydraulic flow just enough to start rotation of central drive gearbox output shaft. Decrease hydraulic flow, if possible, allowing just enough flow to keep shaft rotating. Carefully observe flap position pointer on side of gearbox. Pointer should stop at UP position. If pointer does not stop within limits (refer to CAUTION following step 10), make adjustments to adjustable followup arm or vertical push-pull

rod as necessary. Lengthening the followup arm decreases overall travel, while shortening the followup arm increases overall travel. Lengthening the vertical push-pull rod increases flap down travel and decreases flap up travel, while shortening the vertical push-pull rod decreases down travel and increases up travel.

(14) Move flap control lever to 50° detent and slowly run gearbox pointer back to DN position. Pointer should stop at approximately same position obtained in step (10). If not, continue adjustments as outlined in step (13) until pointer stops in proper position at both the UP and DN positions on the gearbox.

(15) Connect flap drive torque tubes to central drive gearbox output shafts. Check that clearance between LH torque tube U-joint and gearbox is not more than 0.15 inch and that clearance between RH torque tube U-joint and gearbox is not more than 0.60 inch. Move flap control lever to 0° detent. Use minimum hydraulic flow to drive central gearbox. Flaps should travel to "up" position and stop. Carefully check flaps while retracting to detect any evidence of binding or rough operation. Make sure that flaps stop before any actuator ball nut contacts a jack screw emergency stop. Flap travel may be stopped by followup linkage or by cutting hydraulic flow.

(16) With flaps retracted, use shop-fabricated "Go" gage (30-40005-903) 1.143 inches wide to measure the equivalent of two screw jack turns between forward emergency ball nut and screw jack stops. Place gage between pivot carriage forward axle and actuator housing on inboard flap and between pivot carriage forward axle and screw jack coupling on outboard flap.

(17) If flaps do not retract to proper position, check adjustment as outlined in step (13).

(18) If flaps retract to approximately proper position with some actuators stopping in position as outlined in step (16) and other actuators out of tolerance in either direction, bring actuators into position as follows:

(a) Disconnect torque tubes from each side of actuator to be adjusted.

(b) Rotate a torque tube segment on either side of actuator in direction necessary to bring flap pivot carriage to required position.

(c) Release torque tube to make sure that no torque is applied, make sure that pivot carriage is holding its proper position, and re-connect torque tubes.

CAUTION: MAKE SURE THAT NO TORQUE IS APPLIED TO TORQUE TUBES DURING CONNECTION. THIS COULD CAUSE JAMMING IN NORMAL OPERATION.

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-18

Insert facing 27-4-0, Page 207, dated Aug. 27/62 (or subsequent)

The instructions on the noted facing page are to be used for all applicable airplanes except as follows: for airplanes not modified per Service Bulletin No. 27-3, delete the instructions where indicated.

Retain this Temporary Revision in your manual until all applicable airplanes have been modified per noted Service Bulletin.

Delete sub-section D. Adjust Individual Flap Asymmetry Switches.

(19) With all flaps and flap actuators adjusted to proper "up" position, extend and retract flaps with minimum hydraulic flow. Check operation for roughness or binding, and check for proper extended and retracted positions.

C. Adjust Flap Carriage Alignment.

(1) Place flap control lever in 10° detent and allow flaps to move to 10 degree down position. Relieve hydraulic pressure.

(2) Remove cotter pin from flap center carriage screw jack aft nut. Adjust dial indicator with shop-fabricated base to read zero with indicator on aft end of screw jack and base on structure. Loosen screw jack aft nut until free; place dial indicator in position and check screw jack forward movement. Record this measurement. Repeat measurement at inboard or outboard screw jack. Record this measurement.

(3) Tighten flap screw jack aft nut(s).

(4) Apply hydraulic pressure, place flap control lever in 50° detent, and allow flaps to move to full down position. Relieve hydraulic pressure and repeat step (2).

(5) If flap center screw jack forward movement is less than 0.015 inch with flaps full down and less than 0.020 inch with flaps at 10 degree deflection and if flap inboard or outboard screw jack forward movement is less than 0.025 inch with flaps full down and less than 0.040 inch with flaps at 10 degree deflection, flap carriage alignment is satisfactory.

(6) If flap carriage alignment is not satisfactory, disconnect torque tubes at most convenient place to isolate and adjust center carriage actuator (refer to 27-4-11, paragraph 1.C.). Rotate gear box drive sprocket one tooth in direction indicated per step (7) or (8) for each 0.010 inch flap carriage movement required.

NOTE: Flap carriage alignment adjustments are preferrably made at center carriage. However, adjustment may be made at inboard or outboard carriage if necessary. If adjustment is made at inboard or outboard carriage, individual flap asymmetry switch must be rigged per paragraph 1.E. If outboard carriage on outboard flap is adjusted, flap drive asymmetry switch and individual flap asymmetry switch must be rigged (refer to 27-4-13, Removal/Installation Flap Drive Asymmetry Switch Assembly, for rigging flap drive asymmetry switch).

(7) If forward movement of a flap center screw jack is excessive, adjust flap center carriage forward, or each flap inboard or outboard carriage aft, the distance of center screw jack movement. A single inboard or outboard carriage may be adjusted aft twice the distance of center screw jack forward movement.

(8) If forward movement of a flap inboard or outboard screw jack is excessive, adjust center carriage aft one-half distance of screw jack movement. A single flap outboard or inboard carriage may be adjusted forward the distance of screw jack movement, or both the outboard and inboard carriages may be adjusted forward one-half the distance of screw jack movement.

(9) Install torque tubes disconnected in step (6) per 27-4-11, paragraph 1.C., and recheck flap carriage alignment per steps (2) through (4).

(10) If flap carriage alignment is satisfactory, torque screw jack aft nuts to between 400 and 500 inch-pounds. Place flap control lever in 0° detent and slowly retract flaps. Use "Go" gage (30-40005-903) to check that minimum gap between forward axle of pivot carriage and screw jack actuator housing on inboard flaps (screw jack coupling on outboard flaps) is 1.143 inches. Place flap control lever in 50° detent and slowly lower flaps. Check that 0.70 inch spacer blocks may be inserted between flap main carriage roller and emergency stops at aft end of track. Install cotter pins in screw jack aft nut.

NOTE: If flap carriage alignment is not within limits as specified in step (5), it will be necessary to make carriage vertical adjustment at the carriage roller eccentrics, to correct for possible flap track misalignment (refer to 27-4-2, steps 1.C.(3) through 1.C.(6) and 27-4-0, paragraph 1.F.).

(11) Operate flaps through full travel at normal rate. If flaps chatter excessively, make the following adjustments.

(12) Determine which screw jack chatters first by visible jerky rotation of screw jack at the screw jack aft nut during flap operation.

NOTE: Flap chatter may be caused by one carriage on a flap lagging behind the other two carriages.

(13) Disconnect torque tubes at each side of lagging carriage actuator (refer to 27-4-11, paragraph 1.C. or 1.G.). Rotate drive sprocket one sprocket tooth in flap down direction.

(14) Connect torque tubes at each side of screw jack actuator (refer to 27-4-11, paragraph 1.D. or 1.H.).

(15) Loosen nut on adjusted screw jack and check carriage alignment per step (2). Maintain screw jack movement specified in step (5). Tighten shaft aft nut.

(16) Operate flaps through full travel and check flap chatter.

(17) Repeat steps (13) through (16) until chatter is reduced satisfactorily.

(18) Torque screw jack aft nut to between 400 and 500 inch-pounds and install cotter pin.

(19) If an inboard or outboard carriage has been adjusted, check individual flap asymmetry switch rigging and operation per 27-4-0, paragraph 1.E. and steps 2.F.(10) through 2.F.(14).

(20) If an outboard flap outboard carriage has been adjusted, check flap drive asymmetry switch rigging and operation per 27-4-13, paragraphs 1.D. and 3.B.

D. Adjust Flap Position Transmitter.

(1) Check that electrical power is applied to the airplane, that both hydraulic systems are pressurized, that FLAP PWR SELECT switch is positioned on NORMAL #1, and that FLAP ASYM CONT circuit breaker is closed.

(2) Check that flap control lever is in 0° detent and that flaps are fully retracted; then install protractor No. 22-18000-901 on LH inboard flap and adjust protractor to read 0 degrees.

(3) Close FLAP POS IND circuit breaker on main circuit breaker panel.

(4) Check flap position indicator on pilot's instrument panel. If indicator does not read 0 (±0.5) degrees, loosen position transmitter adjusting screws and adjust transmitter to obtain 0-degree reading on indicator.

(5) Tighten position transmitter adjusting screws.

(6) Move flap control lever to 10°, 27°, 36°, and 50° detents. At each flap control lever position, flap position indicator reading must correspond with flap protractor reading within 4 degrees.

(7) Readjust flap position transmitter as necessary until correct flap position indicator readings are maintained through two complete cycles.

(8) Lockwire adjustment screws and return airplane to normal configuration.

E. Adjust Individual Flap Asymmetry Switches.

(1) Actuate flap control lever to 0° detent and raise flaps to "full up" position.

(2) At LH outboard flap, adjust asymmetry switch cable turnbuckles, as necessary, to position pointers on asymmetry switch assembly so that they are both pointed upward.

(3) Check that switch actuates when either cable is pulled out of switch assembly from 0.75 to 1.0 inch and that load on each cable is 20 (±3.0) pounds.

(4) Actuate flap control lever to 50° detent and lower flaps to "full down" position.

(5) Check that there are at least 1.5 cable turns on each cable drum, that switch deactuates when either cable is pulled out of switch assembly from 0.75 to 1.0 inch, and that load on each cable is 33 (±3.0) pounds.

(6) Repeat steps (2) through (5) for LH inboard and RH inboard and outboard flaps.

NOTE: If operational requirements are not met for any flap, raise flaps, disconnect cables from flap, and set for seven cable turns with no load on each cable drum.

F. Adjust Flap Trailing Edge Alignment.

(1) Actuate flap control lever to 0° detent and raise flaps to "full up" position.

(2) Distance between inboard flap inboard trailing edge and wing fillet should be 0.50 (±0.12) inch. Mismatch between outboard flap outboard trailing edge and wing trailing edge should not exceed 0.38 inch.

NOTE: Alignment check should be made with airplane on landing gear and wing tanks defueled.

(3) If flap trailing edge is out of alignment, lower flaps and make the following adjustments:

NOTE: Flap main carriage aft lower rollers must be adjusted evenly so that all six rollers on each flap contact flap track lower surface when upward pressure is manually applied to extended flap trailing edge. If the position of only one end of a flap trailing edge is to be changed, the opposite end carriage rollers may remain unchanged and the center carriage rollers adjusted only half the amount that the end carriage is adjusted.

TEMPORARY REVISION NO. 27-96

This temporary revision supersedes Temporary Revision No. 27-78

Insert facing 27-4-0, Page 210, dated Sep. 25/63 (or subsequent).

Page 210, subsection E. on page 210 is applicable to airplanes incorporating Service Bulletin No. 27-3. For airplanes not incorporating Service Bulletin No. 27-3, delete subsection E.

(a) Adjust eccentric bushings at main carriage aft lower rollers. Adjust rollers down to raise flap trailing edge.

NOTE: Special eccentric bushings with additional eccentricity of 0.03 inch are available to provide 0.50 inch increased adjustment capability at flap trailing edge.

(b) With flaps extended, manually push up on flap trailing edge to simulate a flight load. With all three aft lower rollers and three forward lower rollers contacting flap track lower surface, adjust clearance of main carriage aft upper rollers to between 0.004 and 0.012 inch.

(c) Check flap pivot carriage alignment (refer to 27-4-0, paragraph 1.C.).

2. Adjustment/Test Flap Control System Functional Test

A. Equipment Required.

(1) Tool No. 22-04303 for force check of flap control lever.

(2) A shop-fabricated "Go" gage (30-40005-903), one end to measure minimum gap of two screw jack turns, or 0.58 inch, between aft ball nut stop and aft screw jack stop, the other end to measure gap of 1.143 inches between forward axle of pivot carriage and screw jack coupling, or actuator housing.

(3) Standard cable tensiometer, 0 to 75 pounds.

(4) Thermometer.

(5) Stop watch.

(6) Hydraulic power unit.

(7) Electric power unit to provide 115/208 volt ac.

(8) Inter-communication system - ship to ground.

(9) Flap protractor No. 22-18000-901 to measure deflection of LH inboard flap.

B. Flap Travel Data (see Figure 203).

(1) General.

Angular measurements are taken with protractor installed on the trailing edges of the LH inboard flap. The protractor reflects flap travel in degrees of arc.

C. Preoperational Check.

(1) Visually check flap controls for proper installation of fairleads, cranks, jack screws, pulleys, quadrants, torque tubes, pressure seals, turnbuckles, terminals, etc. All installations requiring safety wire shall be properly safetied.

(2) Check tension of flap control cables. Cable tension shall be 50 (±5) pounds at 70 degrees F (21 degrees C). Increase or decrease specified cable tension 0.25 pounds for each degree F (0.50 pounds for each degree C) increase or decrease respectively in free air temperature. Check that two NAS651 clips are installed in each flap control cable turnbuckle, or that turnbuckles are safetied.

D. Preparation.

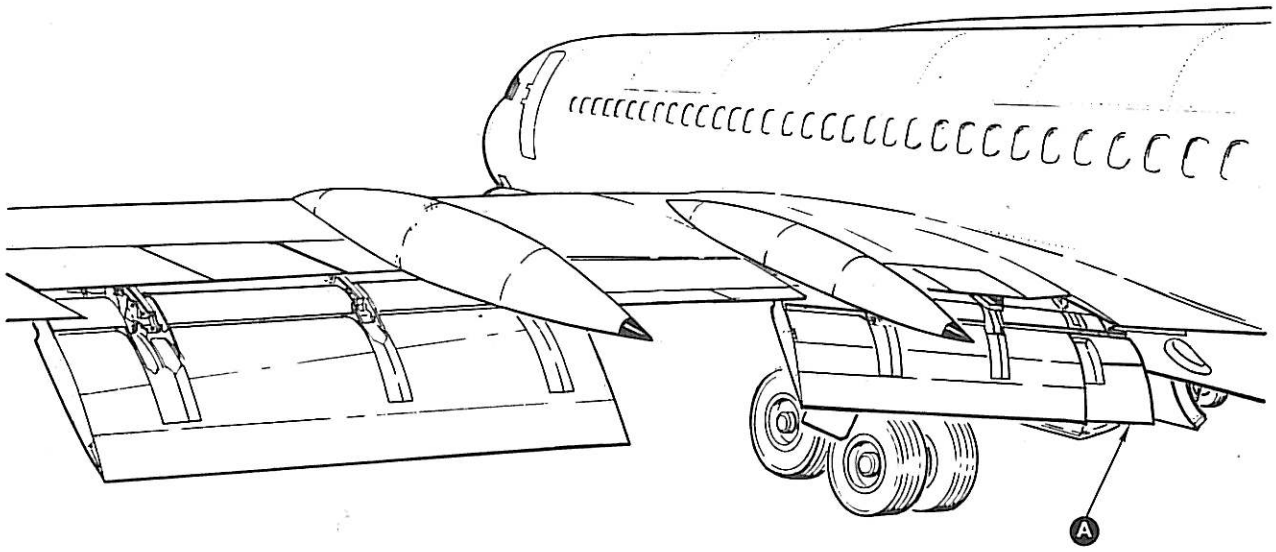
(1) Clear all obstructions from area that might cause damage to trailing edge flaps or leading edge flaps during operation.

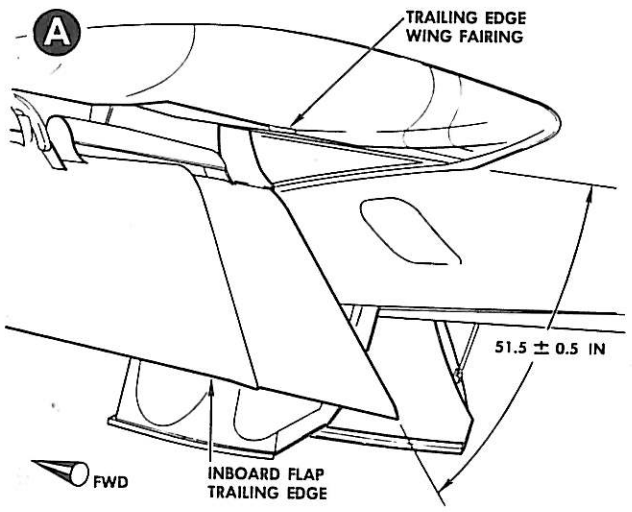
(2) Check to ensure that flap control lever setting corresponds to flap position.

(3) Connect external source of electrical power and close FLAP ASYM CONT circuit breaker (refer to Chapter 24, ELECTRICAL POWER).

(4) Connect external hydraulic power source and pressurize both hydraulic systems (refer to Chapter 29, HYDRAULIC POWER). Move FLAP PWR SELECT switch to NORMAL #1 position.

CAUTION: DO NOT OPERATE FLAPS WHEN BOTH HYDRAULIC SYSTEMS ARE PRESSURIZED UNLESS ELECTRICAL POWER IS APPLIED TO THE AIRPLANE AND THE "FLAP ASYM CONT" CIRCUIT BREAKER IS CLOSED.





INBOARD FLAP	LINEAR DEFLECTION
	DOWN
FULL DOWN	51.5 ± 0.5 INCH

30.02.27.197A

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-19

Insert facing 27-4-0, Page 212, dated Aug. 27/62 (or subsequent).

The instructions on the noted facing page are to be used for all applicable airplanes except as follows: for airplanes not modified per Service Bulletin No. 27-3, delete the instructions where indicated.

Retain this Temporary Revision in your manual until all applicable airplanes have been modified per noted Service Bulletin.

Delete steps (10) through (14) on 27-4-0, Page 212, dated Aug. 27/62.

E. Flap Travel and Timing Checks.

NOTE: Leading edge flap operation is controlled by the flap control lever. Therefore, leading edge flaps will operate during flap operations. Consequently, Leading Edge Flap Functional Test may be accomplished simultaneously with this test. Operation of the elevator downspring may also be checked during this test (refer to Adjustment/Test Elevator Control System).

(1) Actuate flap control lever to 50° detent.

(2) Slowly move flap control lever to 0° detent.

(a) Flaps shall move smoothly to "full up" position.

(b) Flap leading edges and carriages shall clear spoiler hydraulic lines, actuators, and all other components in wing trailing edge.

(c) Aft cable quadrant lower, or "flap up", stop shall contact flap control fixed stop.

(d) Stops on all ball nuts shall stop at least 2 turns from making contact with jack screw emergency stops. Use shop-fabricated "Go" gage 1.143 inches wide to check distance equivalent to 2 turns. Place gage between pivot carriage forward axle and flap actuator housing on inboard flaps and between pivot carriage forward axle and screw jack coupling on outboard flaps.

(3) Install flap protractor, No. 22-18000-901 on trailing edge of LH inboard flap. Adjust protractor to read 0° with flaps retracted.

(4) Install tool No. 22-04303 on pilots' pedestal to measure force required to unlock and actuate flap control lever.

(5) Using test tool, disengage flap control lever lock and pull lever aft until stops on flap aft control quadrant make contact.

(a) Force required to disengage flap control lever lock shall not exceed 10 pounds. (Pull vertically on tool when measuring disengage load required.)

(b) With spring scale maintained in position perpendicular to flap control lever, force required to actuate flap control lever shall not exceed 10 pounds at any point in lever travel.

(c) All flaps shall move smoothly to "full down" position.

(6) With all flaps in "full down" position, check that gaps between flap emergency down stops and flap main carriage rollers are at least 0.70 inch and that screw jack torque stops are at least 2 turns from making contact.

NOTE: Wait three minutes after lowering flaps before checking gaps at emergency and screw jack torque stops. Check gaps between torque stops with shop-fabricated "Go" gage 0.58 inch wide.

(7) Using test tool attached to flap control lever, actuate flap control lever to 0° detent.

(a) Flaps shall move smoothly to 0 (±0.5) degree position.

(b) Force required to actuate flap control lever from 50° detent to 0° detent shall not exceed 10 pounds at any point in flap control lever travel.

(8) Remove test tool from flap control lever.

(9) Actuate flap control lever to 10° detent and allow flaps to move to position selected.

(10) Actuate FLAP PWR SELECT switch to ALTERNATE #2 position.

(11) Actuate flap control lever to 0° detent and allow flaps to move to "full up" position.

(12) With flaps in "full up" position, flap screw jack forward stops shall be at least 2 screw jack turns from making contact. Use "Go" gage to check that gap between forward axle of pivot carriage and housing of screw jack coupling is at least 1.143 inches. Wait three minutes prior to measuring gap.

(13) Return FLAP PWR SELECT switch to NORMAL #1 position.

(14) Move flap control lever from 0° detent to 50° detent. Using stop watch, check time required for flaps to move from 0 to 25 degrees. Time shall be 22 (±4.0) seconds.

(15) Move flap control lever from 50° detent to 0° detent. Using stop watch, check time required for flaps to move from "full down" position to 25 degrees. Time shall be 10 (±3.0) seconds.

F. Asymmetry Switch Check.

(1) Make sure that FLAP PWR SELECT switch, on overhead switch panel, is in NORMAL #1 position.

(2) Close FLAP ASYM CONT circuit breaker on main circuit breaker panel.

(3) Momentarily actuate FLAP ASYM switch, on pilot's pedestal, to SW TEST position. FLAP ASYM LIGHT shall illuminate. Release switch; FLAP ASYM light shall extinguish.

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-74.

Insert facing 27-4-0, Page 215, dated Feb. 15/63 (or subsequent).

The instructions on the noted facing page are to be used for all applicable airplanes except as follows: for airplanes not modified per Service Bulletin No. 27-3, delete the instructions where indicated.

Retain this Temporary Revision in your manual until all applicable airplanes have been modified per noted Service Bulletin.

Page 215, delete steps (10) through (14).

(4) Actuate flap control lever to 50° detent. While flaps are moving, actuate FLAP ASYM switch to RELAY TEST position. FLAP ASYM light shall illuminate and flaps shall immediately stop moving.

(5) Release FLAP ASYM switch. FLAP ASYM light shall go out and flaps shall move to "full down" position.

(6) Actuate FLAP PWR SELECT switch to ALTERNATE #2 position.

(7) Actuate flap control lever to 36° detent. While flaps are moving, actuate FLAP ASYM switch to RELAY TEST position. FLAP ASYM light shall illuminate and flaps shall immediately stop moving.

(8) Release FLAP ASYM switch. FLAP ASYM light shall extinguish and flaps shall move smoothly to position selected.

(9) Actuate FLAP PWR SELECT switch to NORMAL #1 position.

(10) Actuate flap control lever to 0-degree detent and allow flaps to move to position selected.

(11) Pull LH inboard flap asymmetry switch cable until it unwinds 0.75 to 1.0 inch from drum of asymmetry sensing device.

(12) Hold cable in this position, actuate flap control lever to any detent and check that flaps do not move.

(13) Return flap control lever to detent corresponding to position of flaps and release asymmetry switch cable.

(14) Repeat steps (11) through (13) for LH outboard, for RH inboard, and for RH outboard flaps.

G. Flap Position Detent Checks.

(1) Check that flap control lever is positioned in 0° detent and that FLAP PWR SELECT switch is in NORMAL #1 position.

(2) Close FLAP ASYM CONT and FLAP POS IND circuit breakers on main circuit breaker panel.

(3) With flaps in "full up" position, note position of extreme inboard tip of LH inboard flap trailing edge with respect to wing trailing edge fairing. This is the 0° position. Flap position indicator shall read 0 (±0.5) degree.

NOTE: All flap travel linear measurements will be made from the above 0° position. A ready reference may be made by aligning the "0" end of a steel tape with the inboard tip of the flap trailing edge. A six-inch scale may then be taped to the end of the steel tape to bridge the gap between the end of the steel tape and the lower surface of the wing trailing edge fairing.

(4) Actuate flap control lever to 10°, 27°, 36°, and 50° detents stopping at each detent to allow flaps to travel to position selected. Allow flap drive torque tubes to come to a complete stop at each setting.

(5) Check that LH inboard flap moves to the positions indicated in Table 1. Flap position indicator shall read within 4 degrees of flap position at each setting.

(6) Actuate flap control lever to 36°, 27°, 10°, and 0° detents allowing flaps drive torque tubes to come to a full stop at each setting.

(7) Check that LH inboard flap moves to the positions indicated in Table 1.

TABLE I

MECHANICAL POSITION DETENT CHECKS

FLAP CONTROL LEVER DETENT POSITION	LH INBOARD FLAP TRAVEL
FULL UP 0°	*
10°	17.0" ± 1.0"
27°	34.3" ± 0.9"
36°	41.6" ± 0.8"
50° FULL DOWN	51.5" ± 0.5"

* At "full up" position, upper surface of inboard end of LH inboard flap shall be 0.50 (±0.12) inch from lower surface of wing fillet.

H. Flap Carriage Alignment Check.

(1) Close FLAP ASYM CONT circuit breaker and check that FLAP PWR SELECT switch is in NORMAL #1 position.

(2) Place flap control lever in 10° detent and allow flaps to move to 10 degree down position. Relieve hydraulic pressure.

(3) Remove cotter pin from flap center carriage screw jack aft nut. Adjust dial indicator with shop-fabricated base to read zero with indicator on aft end of screw jack and base on structure. Loosen screw jack aft nut until free; place dial indicator in position and check screw jack forward movement. Record this distance. If center screw jack movement is 0.005 inch or less, repeat measurement at inboard or outboard screw jack. Record this measurement.

(4) Repeat step (3) on each flap.

(5) Tighten flap screw jack aft nuts loosened in step (3).

(6) Place flap control lever in 50° detent and allow flaps to move to full down position. Relieve hydraulic pressure and repeat steps (3) and (4).

(7) Flap center screw jack forward movement should be less than 0.015 inch with flaps full down and less than 0.020 inch with flaps at 10 degree deflection. Flap outboard or inboard screw jack forward movement should be less than 0.025 inch with flaps full down and less than 0.040 inch with flaps at 10 degree deflection.

(8) Torque flap screw jack aft nuts to between 400 and 500 inch-pounds and install cotter pins.

(9) Return airplane to normal configuration.

3. Adjustment/Test Flap Warning Horn Circuit

A. Equipment Required.

(1) External source of hydraulic power.

(2) External source of electrical power.

(3) Deleted.

(4) Flap switch assembly continuity test box, test tool No. 30-43503.

(5) Source of dry air or nitrogen to deliver from 0 to 4 inches mercury (Hg) pressure at pitot tube.

B. Test Warning Horn.

(1) Move all engine power levers to IDLE position.

(2) Connect electric power source to airplane and energize 28-volt DC EMER BUS and 28-volt DC ESS BUS (refer to Chapter 24, ELECTRIC POWER).

(3) Make sure that FLAP PWR SELECT switch is in NORMAL #1 position and close following circuit breakers;

(a) WARN HORN

(b) RH LANDING GEAR GRD SAFETY RELAYS AND LH LANDING GEAR GRD SAFETY RELAYS

(c) LG HANDLE SOL

(d) FLAP ASYM CONT

(e) STAB POS IND

(4) Check that flap control lever setting corresponds roughly with flap position, connect hydraulic power unit to airplane, and pressurize both airplane hydraulic systems (refer to Chapter 29, HYDRAULIC POWER).

(5) Make sure that area is clear of all obstructions that could cause damage to flaps, slats, leading edge flaps, ailerons, or stabilizer when these surfaces are operated.

(6) Using stabilizer trim lever on pilot's pedestal, adjust stabilizer to obtain 4 ($\pm$2) degrees airplane nose up and actuate flap control lever to 0° detent.

(7) Secure LH, RH and Nose Landing Gear LH DOWN AND LOCKED switches in "gear down" position and make sure that LH and RH LG GROUND SAFETY switches are in "groundborne" position.

(8) Make sure that landing gear control lever is in DOWN position.

(9) Make sure that speed brake control lever is in stowed position.

(10) Advance any two power levers to TAKEOFF position. Warning horn shall sound intermittently, one second on and one second off.

(11) Slowly move flap control lever from 0° detent to 10° detent. Warning horn shall cease sounding before flaps stop moving.

(12) Actuate flap control lever to 27° detent and check that warning horn sounds "1 second on - 1 second off" while flaps are in transit and ceases sounding before flaps stop moving.

(13) Actuate flap control lever to 50° detent and check that warning horn continues to sound "1 second on - 1 second off" throughout remainder of flap travel.

(14) Retard power levers to IDLE position and check that warning horn stops sounding.

TEMPORARY REVISION NO. 27-26.

Insert facing 27-4-0, Page 218, dated Oct. 15/62 (or subsequent).

This temporary revision is applicable to Group I airplanes (refer to Manual INTRODUCTION for explanation of group designations).

For Group II airplanes use the information on 27-4-0, Page 218.

Page 218, delete last sentence in paragraph under 4.A. General and substitute the following:

> Air may also enter the hydraulic system if the flaps are operated only on the No. 2 hydraulic system.

(15) Actuate flap control lever to 36° detent and allow flaps to move to position selected.

(16) Open RH LANDING GRD SAFETY RELAYS circuit breaker on main circuit breaker panel and place all power levers in CRUISE position.

(17) Actuate and secure RH LG DOWN & LOCKED switch in "gear up" position.

(18) Actuate flap control lever to 50° detent and check that flaps move to position selected and that warning horn sounds continuously.

(19) Return RH LG DOWN & LOCKED switch to "gear down" position and check that warning horn stops sounding.

(20) Actuate and secure LH LG DOWN & LOCKED switch in "gear up" position and check that warning horn sounds continuously.

(21) Return LH LG DOWN & LOCKED switch to "gear down" position and check that warning horn stops sounding.

(22) Actuate and secure NLG DOWN & LOCKED switch in "gear up" position and check that warning horn sounds continuously.

(23) Actuate flap control lever to 36° detent and check that flaps move to position selected and warning horn stops sounding.

(24) Return NLG DOWN & LOCKED switch to "gear down" position.

C. Flap Position versus Airspeed Warning Test.

(1) Connect 0 to 2 psig (4 in. Hg) dry air or nitrogen pressure source to RH pitot probe.

(2) Make sure that STATIC PRESSURE SELECTOR valve handle is in NORMAL position.

(3) Move flap control lever to 50° detent. Allow flaps to extend to "full down" position.

(4) Close FLAP & AILERON WARNING LTS circuit breaker.

(5) Increase pressure slowly on RH pitot probe from 0 to 1.62 (±0.11) inches Hg (182 (±5.0) knots). Check that ADJUST FLAPS light on instrument panel illuminates.

(6) Slowly move flap control lever to 36° detent. ADJUST FLAPS light shall go out before flaps stop moving.

(7) Slowly increase pressure on RH pitot probe to 1.90 (±0.11) inches Hg (197 (±5.0) knots). ADJUST FLAPS light shall illuminate.

(8) Slowly move flap control lever to 27° detent. Light shall go out before flaps stop moving.

(9) Slowly increase pressure at RH pitot probe to 2.23 (±0.11) inches Hg (213 (±5.0) knots). ADJUST FLAPS lights shall illuminate.

(10) Slowly move flap control lever to 10° detent. Light shall go out before flaps stop moving.

(11) Slowly increase pressure on right-hand pitot probe to 2.61 (±0.11) inches Hg (230 (±5.0) knots). ADJUST FLAPS light shall illuminate.

(12) Slowly move flap control lever to 0° detent. Light shall go out before flaps stop moving.

(13) When all checks are satisfactory, decrease pitot pressure to atmospheric, disconnect and remove test equipment, and return airplane to normal configuration.

D. Flap Switch Assembly Test.

(1) Disconnect electrical plug from flap switch assembly on central drive gearbox.

(2) Connect test tool No. 30-43503 to flap switch assembly electrical receptacle and actuate test tool power switch to ON.

(3) Check that FLAP ASYM CONT circuit breaker is closed and that FLAP PWR SELECT switch is positioned on NORMAL #1.

(4) Check that flap control lever is in 0° detent and that flaps are in "full up" position.

(5) Move flap control lever slowly in "flaps down" direction and check that test lights illuminate and extinguish as indicated in Table II as flaps move downward.

NOTE: Test light numbers correspond to switch functions as follows:

#1	LANDING WARN	#11	0°	STALL WARN
#2	TAKE-OFF WARN	#12	10°	
#3	NO. 4 Flap Position	#13	27°	
#4	NO. 3 Flap Position	#14	36°	
#5	NO. 2 Flap Position	#15	50°	
#6	NO. 1 Flap Position	#16	HORIZONTAL STABILIZER RATE	
#7	SPARES			
#8				
#9				
#10				

CONVAIR MODEL 30

MAINTENANCE MANUAL

TEMPORARY REVISION NO. 27-41.

This temporary revision supersedes Temporary Revision No. 27-26.

Insert facing 27-4-0, Page 221, dated Oct. 15/62 (or subsequent).

This temporary revision is applicable to Group I airplanes (refer to Manual INTRODUCTION for explanation of group designations).

For Group II airplanes use the information on 27-4-0, Page 218.

Page 218, delete last sentence in paragraph under 4.A. General and substitute the following:

Air may also enter the hydraulic system if the flaps are operated only on the No. 2 hydraulic system or if the leading edge flaps and slats are operated with either hydraulic system not pressurized.

(6) When flap switch assembly test is satisfactory, actuate test tool power switch to OFF and disconnect test tool from airplane.

(7) Install electrical connector in switch receptacle.

TABLE II

FLAP POSITION	TEST LIGHTS											
	#1	#2	#3	#4	#5	#6	#11	#12	#13	#14	#15	#16
FULL UP	EXT	ILL	EXT	EXT	EXT	EXT	ILL	EXT	EXT	EXT	EXT	EXT
3.0" MAX.							EXT					
4.0"to 9.5"												ILL
5.0"to 9.5"						ILL						
10.0"to 15.0"		EXT						ILL				
18.7"to 22.7"		ILL						EXT				
28.8"to 32.9"									ILL			
28.8"to 33.1"					ILL							
29.6"to 33.1"		EXT										
35.4"to 37.7"		ILL										
35.4"to 38.5"									EXT			
37.7"to 40.7"				ILL						ILL		
42.7"to 46.8"										EXT		
44.5"to 48.7"			ILL									
45.4"to 49.3"	ILL											
47.0" to FULL DOWN											ILL	
FULL DOWN												

NOTE: In final checkout, the cam may be rotated to obtain proper switch actuation positions. With flaps up, the 0° position index pin hole need not be in line.

(8) Disconnect pressure source from RH pitot probe.

4. Adjustment/Test Flap Control System Bleeding Procedure

A. General.

After breaking into the hydraulic system, the system must be bled to remove any trapped air. Air may also enter the hydraulic system if the flaps are operated only on the No. 2 hydraulic system.

B. Equipment Required.

(1) External source of electrical power.

(2) External source of hydraulic power.

C. Hydraulic System Bleeding Procedure.

(1) Check that all test tools have been removed from the flap and slat control systems and that the area is free of obstructions that might interfere with flap or slat operation.

(2) Connect external source of electrical power to airplane (refer to Chapter 24, ELECTRICAL POWER).

(3) Close FLAP ASYM CONT circuit breaker on main circuit breaker panel.

(4) Connect external source of hydraulic power to airplane and pressurize No. 1 and 2 hydraulic systems (refer to Chapter 29, HYDRAULIC POWER).

CAUTION: DO NOT OPERATE THE FLAPS WHEN BOTH HYDRAULIC SYSTEMS ARE PRESSURIZED UNLESS ELECTRICAL POWER IS APPLIED TO THE AIRPLANE AND THE "FLAP ASYM CONT" CIRCUIT BREAKER IS CLOSED.

(5) Position FLAP PWR SELECT switch on ALTERNATE #2.

(6) Cycle flaps from "flaps up" to "flaps down" to "flaps up" 10 times.

(7) Position FLAP PWR SELECT switch on NORMAL #1.

(8) Cycle flaps from "flaps up" to "flaps down" to "flaps up" 10 times.

(9) Return airplane to normal configuration.

WING TRAILING EDGE FLAPS - MAINTENANCE PRACTICES

1. Removal/Installation - Wing Trailing Edge Flaps (see Figure 201)

A. General.

Removal and installation procedures for inboard and outboard flaps are identical except for the absence of bushings in the bearings of the inboard pivot carriage of each inboard flap.

B. Equipment Required.

(1) Flap sling.

(2) Hoist capable of lifting flap assembly.

(3) External source of electrical power.

(4) External source of hydraulic power.

(5) Spoiler actuator lock No. 22J-115.

C. Remove Flap.

(1) Connect external source of electrical power and close FLAP ASYM CONT circuit breaker on main circuit breaker panel (refer to Chapter 24, ELECTRICAL POWER).

(2) Check that FLAP PWR SELECT switch is positioned on NORMAL #1 and that flap control lever setting corresponds roughly with position of flaps.

(3) Connect external source of hydraulic power and pressurize No. 1 and No. 2 hydraulic systems (refer to Chapter 29, HYDRAULIC POWER).

CAUTION: DO NOT OPERATE FLAPS WHEN BOTH HYDRAULIC SYSTEMS ARE PRESSURIZED UNLESS ELECTRICAL POWER IS APPLIED TO THE AIRPLANE AND THE "FLAPS ASYM CONT" CIRCUIT BREAKER IS CLOSED.

(4) Actuate flap control lever to 50° detent and lower flaps.

(5) Actuate speed brake handle to full aft position and raise spoilers.

(6) Install spoiler actuator lock No. 22J-115 at each pair of spoiler actuators to prevent inadvertent closing of spoilers.

(7) Depressurize hydraulic systems (refer to Chapter 12, SERVICING).

(8) Position sling around flap and connect sling to hoist. Operate hoist to support weight of flap.

(9) At each flap track station, remove bolts, washers, and cone bushings from flap adapter main carriage fittings.

(10) At each flap track station, remove bolt and washers from flap adapter pivot carriage fitting.

(11) Pry bushings part way out of pivot carriage bearings and separate pivot carriages from flap adapters.

NOTE: Bushings are not used in inboard pivot carriage of inboard flaps.

(12) If removing an inboard flap on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, disconnect individual flap asymmetry switch cable near inboard and outboard ends of flap leading edge.

(13) Lower flap away from airplane.

D. Install Flap.

(1) Fasten sling around flap, connect sling to hoist, and raise flap into position for mounting on airplane.

(2) Adjust position of flap to align bolt holes in pivot carriage fittings with bolt holes in flap adapter bearings.

(3) Insert bushings and shims in bolt holes in each pivot carriage fitting.

NOTE: Bushings are not required in inboard pivot carriages of inboard flaps.

(4) Slide washer over each bolt and insert bolt through pivot carriage bushings and flap adapter pivot carriage bearing. Install two washers and nut. Tighten nut and secure with cotter pin.

(5) Adjust position of each main carriage to align bolt holes in main carriage fittings with bolt holes in flap adapter main carriage fittings.

(6) Coat outside surface of four cone bushings lightly with graphite grease, Specification MIL-G-7187, and insert cone bushings in bolt holes in flap adapter main carriage fittings.

(7) Slide washer over each bolt and insert bolts through cone bushings and main carriage bearings.

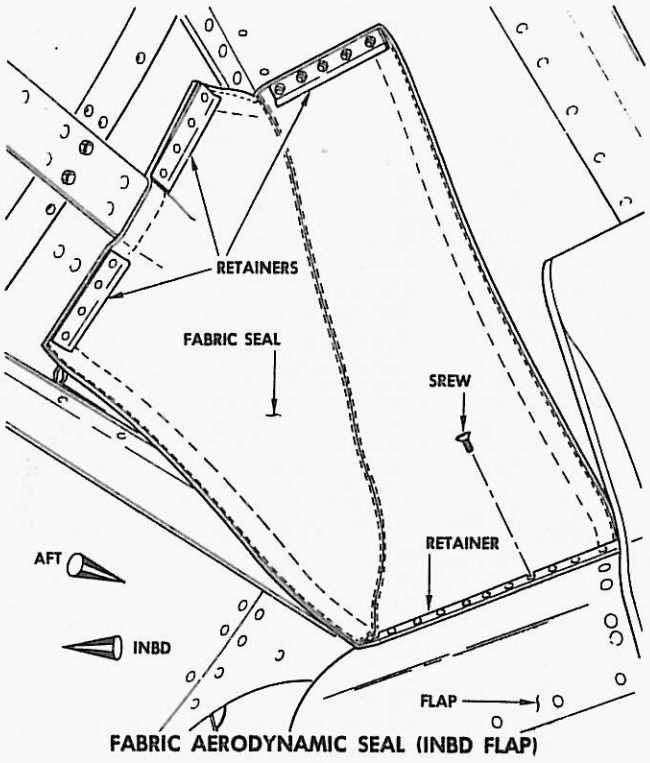
(8) Install washer and nut on each bolt.

TEMPORARY REVISION NO. 27-97

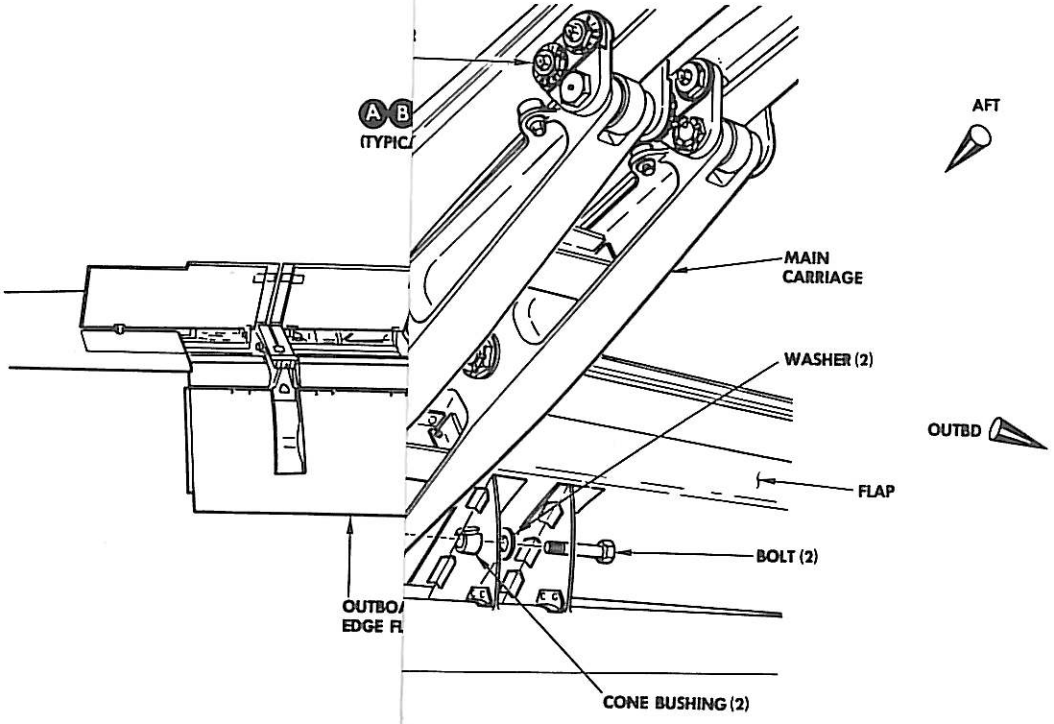
Insert facing 27-4-1, Page 203, dated Sep. 25/63 (or subsequent).

The illustration on page 203 is to be used for all applicable airplanes except as follows: for airplanes not modified per Service Bulletin No. 27-47, add the view on this temporary revision to the illustration on page 203.

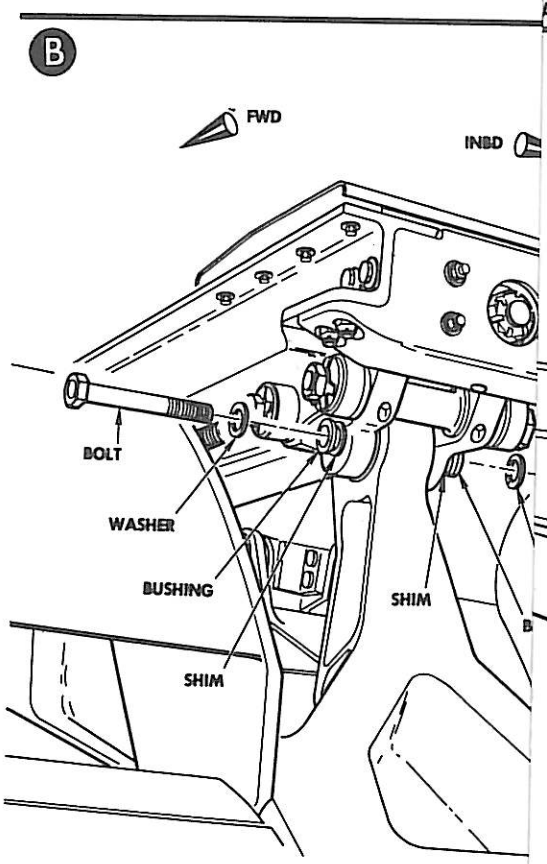
Retain this temporary revision in your manual until all applicable airplanes have been modified per noted service bulletin.



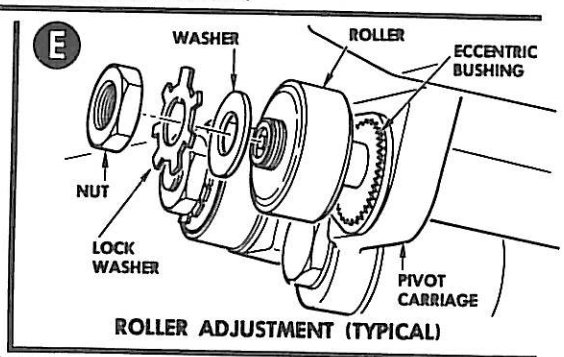
FABRIC AERODYNAMIC SEAL (INBD FLAP)



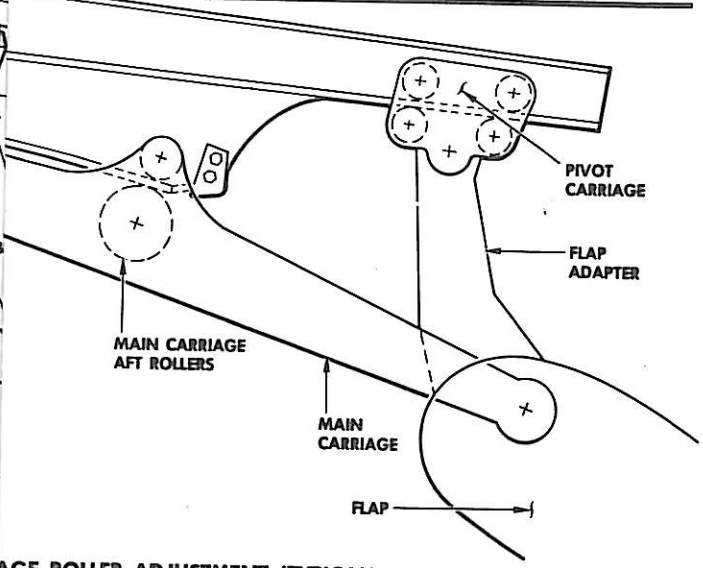
AGE TO FLAP ATTACHMENT (TYPICAL)



PIVOT CARRIAGE TO FLAP ATTACHMENT (



ROLLER ADJUSTMENT (TYPICAL)



AGE ROLLER ADJUSTMENT (TYPICAL)

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(9) Insert metal wedges between aft ends of each main carriage and adjacent surface of flap adapter main carriage fitting and center main carriage bearings in fittings.

(10) Tighten each nut until cone bushings are in contact with main carriage bearing.

(11) Loosen nut, remove metal wedges, tighten nut, and safety with cotter pin.

(12) When all three main carriages have been mounted on flap, remove sling and spoiler actuator lock.

(13) If installing an inboard flap on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, connect individual flap asymmetry switch cable near inboard and outboard ends of flap leading edge. Adjust length of cables to position pointers at aft end of switch assembly straight up. Safety cable adjustment.

(14) Check flap control system operation (refer to 27-4-0, Adjustment/Test Flap Control System Functional Test).

NOTE: If a wing trailing edge flap only has been replaced and no other rigging or adjustment was changed, check flap operation per 27-4-0, steps 2.E.(15), 2.E.(14) and paragraph 1.F. (Perform steps in sequence listed.) If an inboard flap was replaced on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, check individual flap asymmetry switch operation per 27-4-0, steps 2.F.(10) through 2.F.(14).

2. Removal/Installation Wing Flap Track Well Seal and Air Reservoir (see Figure 202)

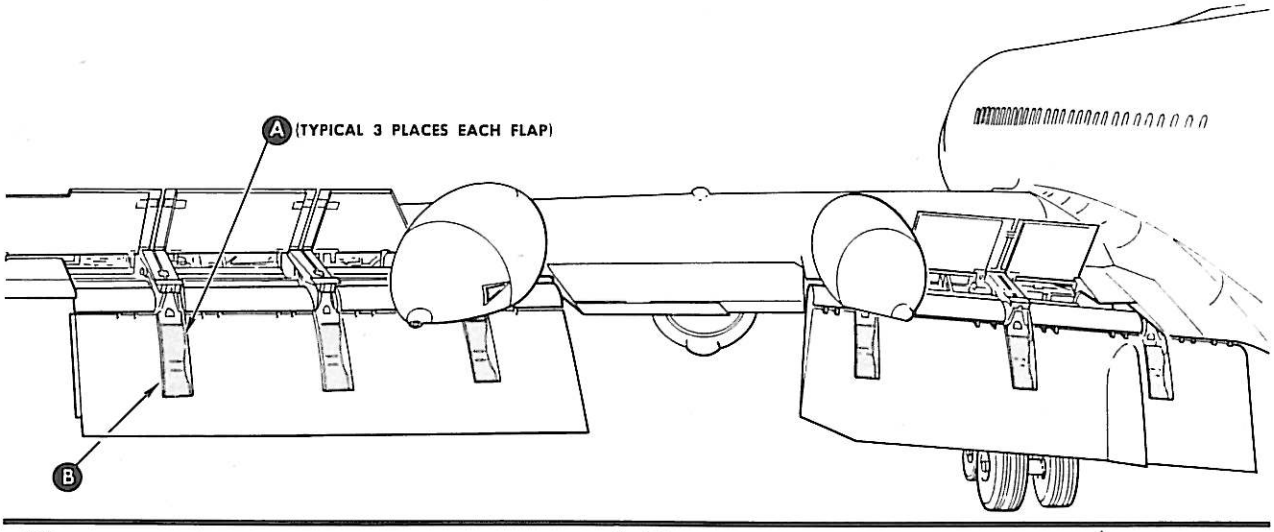
A. Equipment Required - None.

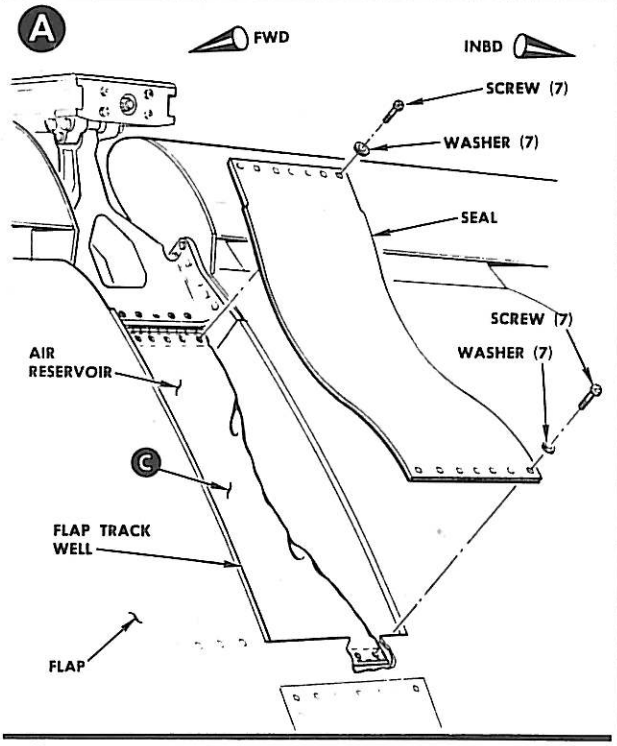
B. Remove Flap Track Well Seal and Air Reservoir.

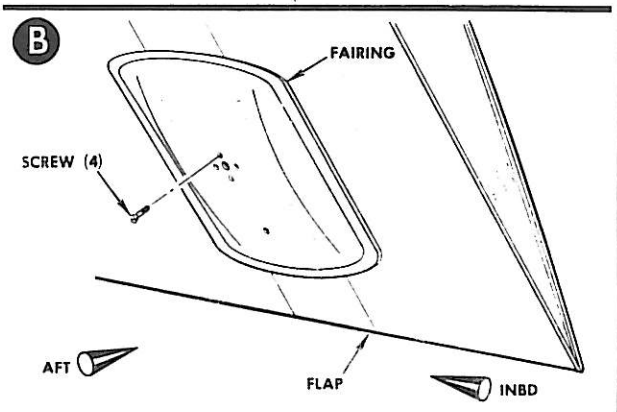
(1) Lower wing trailing edge flap (refer to steps 1.C.(1) through 1.C.(4) for detailed procedure).

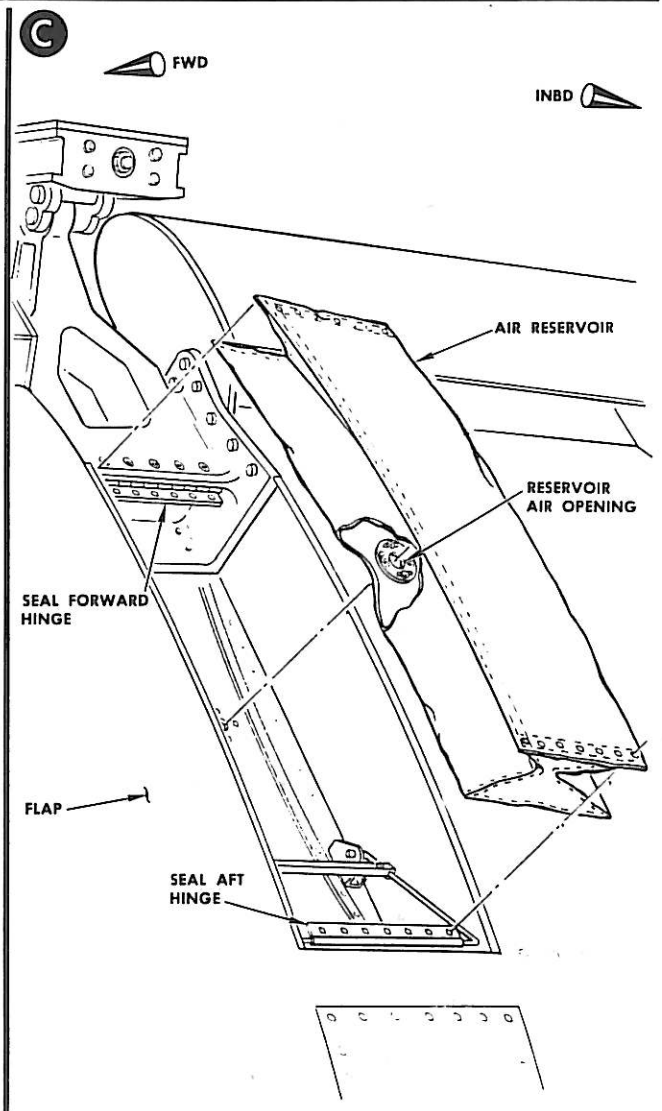
(2) Remove seal attaching screws at forward and aft ends of seal and remove seal.

(3) Remove flap seal air reservoir attaching screws at air reservoir opening in fairing on lower side of flap. Remove air reservoir.









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Wing Flap Track Well Seal Installation
Figure 202

C. Install Flap Track Well Seal and Air Reservoir.

(1) Place flap seal air reservoir in position and install screws at air reservoir opening in fairing on lower side of flap.

(2) Place seal in position and install attaching screws at forward and aft ends of seal.

(3) Return airplane to normal configuration.

WING FLAP MAIN CARRIAGES - MAINTENANCE PRACTICES

1. Removal/Installation - Wing Flap Main Carriages (see Figure 201)

   A. Equipment Required - Eccentric bushing tool - No. 30-J-58 (or equivalent).

   B. Remove Flap Main Carriage.

      (1) Remove flap (refer to Removal/Installation - Wing Trailing Edge Flaps).

      (2) Remove bolts attaching emergency stops at aft end of lower curved flap tracks.

      (3) Slide main carriage aft until rollers clear flap track.

      (4) Remove fairing from lower side of flap main carriage.

   C. Install Flap Main Carriage.

      (1) Position main carriage and roll carriage forward onto flap tracks.

      (2) Install emergency stops at aft end of lower flap tracks.

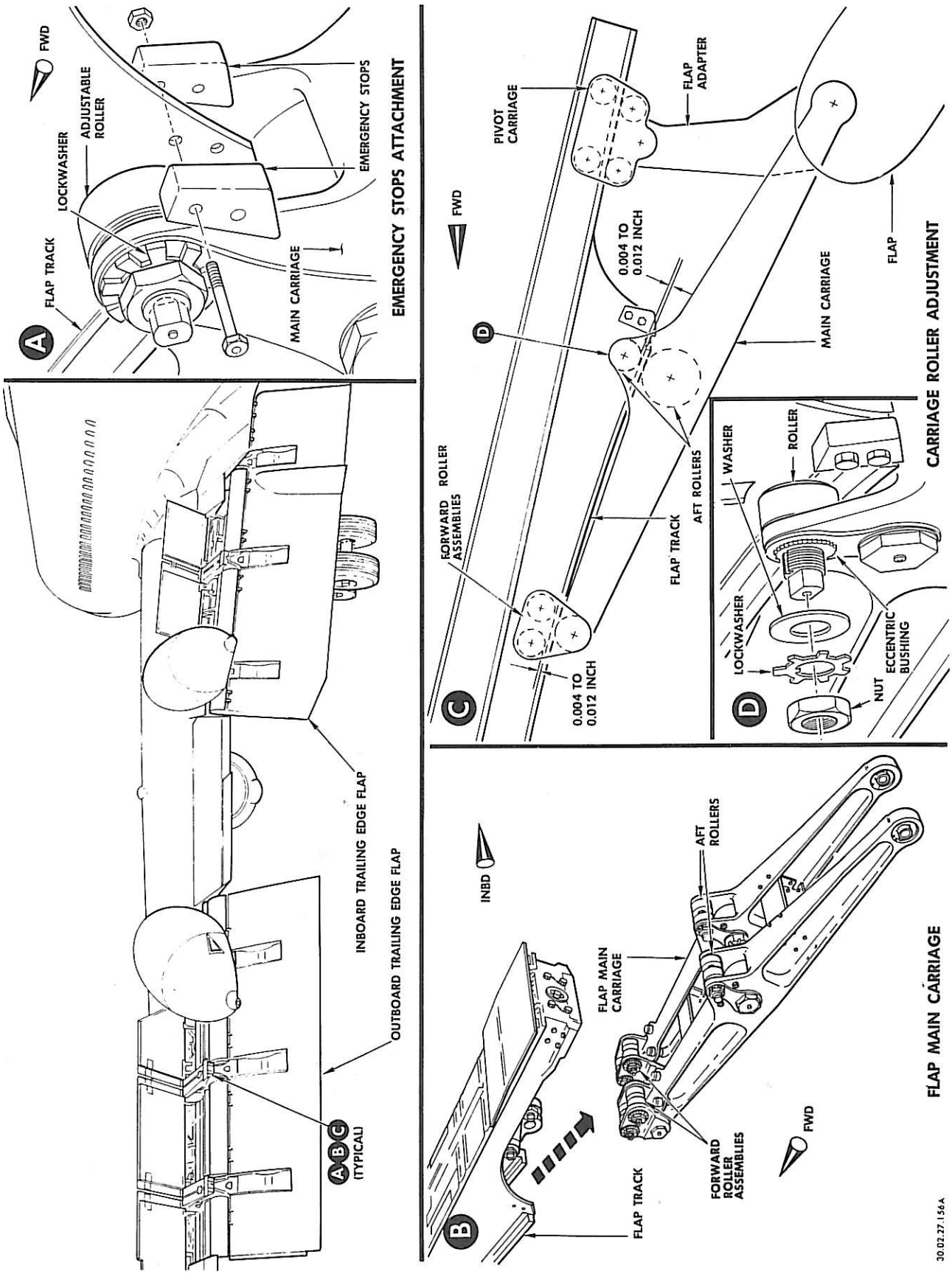
      (3) Push up on main carriage and measure distance between bearing center at aft end of carriage (flap attach point) and flap track lower surface. Distance must be 1.73 (±0.03) inches on inboard flaps, and 2.17 (±0.03) inches on outboard flaps. If distance is not within tolerance, adjust main carriage lower aft rollers as follows:

         (a) Bend back lockwasher tabs at upper aft rollers and remove nuts. Remove cotter pins and nuts from aft lower roller pivot bolts. Partially remove pivot bolts until eccentric bushing locks can be removed from eccentric bushings at each end of upper and lower aft rollers. Adjust aft lower roller eccentric bushings as necessary to obtain correct distance between main carriage aft bearing centers and flap track lower surface. Adjust eccentric bushings equally at each end of roller so that pivot bolt will move freely from side to side.

         (b) Install eccentric bushing locks and reinstall aft roller pivot bolts. Do not install cotter pins in pivot bolts at this time.

         CAUTION: DO NOT ACTUATE FLAP SCREW JACKS WHEN MAIN AND PIVOT CARRIAGES ARE INSTALLED WITHOUT FLAP BEING INSTALLED. SEVERE DAMAGE TO CARRIAGE ROLLERS AND FLAP TRACKS MAY RESULT.

      (4) Install flaps (refer to 27-4-1, Removal/Installation Wing Trailing Edge Flaps).



Wing Flap Main Carriages Installation
Figure 201

(5) With main carriage forward lower rollers tight against flap track lower surface, check clearance between forward upper rollers and flap track upper surface. Clearance must be not less than 0.004 or more than 0.012 inch. If clearance is not within tolerances, adjust upper rollers as follows:

(a) Bend back lockwasher tabs at each forward upper roller; remove nuts, washers, and eccentric bushing locks. Adjust eccentric bushings to obtain correct clearance between forward upper rollers and flap track upper surface. Reinstall eccentric bushing locks, washers, lockwashers, and nuts. Determine that rollers turn freely after torquing nuts. Safety nuts by bending lockwasher tabs.

(6) Manually push up on flap trailing edge so main carriage aft lower rollers are tight against flap track lower surface. Check clearance between aft upper rollers and flap track upper surface. Clearance must be the same as that obtained at the forward upper rollers in step (5). If clearance is not the same, adjust aft upper rollers as follows:

(a) Loosen lower aft roller pivot bolts and partially remove bolts so that eccentric bushing locks can be freed from eccentric bushings at each end of upper and lower aft rollers. Adjust aft upper rollers eccentric bushings to obtain same clearance as forward upper rollers were adjusted to in step (5).

(b) Install eccentric bushing locks. Use care to not turn aft lower roller eccentric bushings when installing eccentric bushing locks.

(c) Install and torque aft lower roller pivot bolts and install cotter pins. Install washers, lockwashers and nuts at upper rollers. Torque nuts and safety with tabs on lockwashers.

NOTE: All rollers must turn freely after nuts are torqued.

(7) Align flap carriages (refer to 27-4-0, paragraph 1.C.).

(8) Check flap control system operation (refer to 27-4-0, Adjustment/ Test Flap Control System Functional Test).

NOTE: If a flap main carriage only has been replaced and no other rigging or adjustment has been changed, check flap control system operation per 27-4-0, steps 2.E.(15), 2.E.(14), and paragraph 1.F., in sequence listed.

(9) Install fairing on lower side of main carriage.

WING FLAP SCREW JACKS - MAINTENANCE PRACTICES

1. Removal/Installation - Wing Flap Screw Jacks (see Figure 201)

A. Equipment Required. None.

B. Remove Wing Flap Screw Jack.

(1) Check that flaps are in "full down" position; if not, lower flaps (refer to Removal/Installation - Wing Trailing Edge Flaps for detailed procedure and equipment required.

(2) Disconnect flap adapter from pivot carriage at all three screw jack locations.

(3) Remove 8 bolts attaching plate to aft upper surface of flap track assembly at screw jack being removed.

(4) Remove 12 bolts attaching screw jack rear thrust bearing housing to flap tracks (see Figure 201).

(5) If removing an outboard or inboard screw jack on an outboard flap, on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, disconnect individual flap asymmetry switch cable from pivot carriage.

(6) Raise trailing edge of flap slightly so that pivot carriage will clear flap adapter, then break thrust bearing housing free from flap track assembly and slide screw jack aft until pivot carriage clears flap tracks.

C. Install Wing Flap Screw Jack.

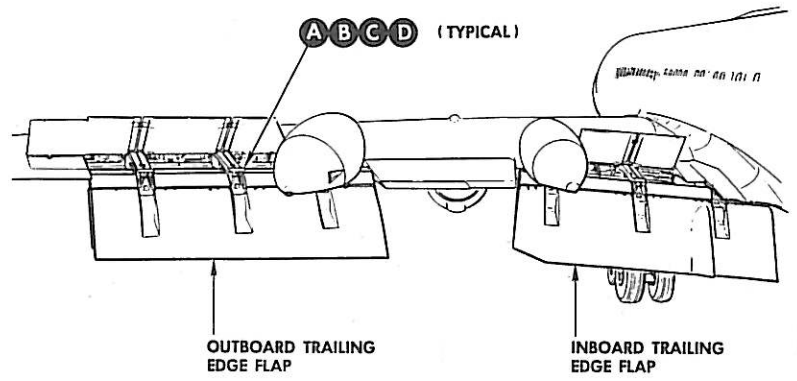
(1) Position pivot carriage about 3 inches from aft end of screw jack.

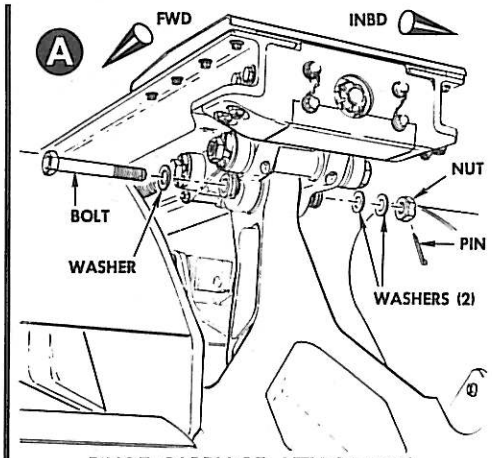
(2) Align flap pivot carriage with aft end of upper straight flap tracks.

(3) Raise trailing edge of flap slightly so that pivot carriage will clear flap adapter, then roll pivot carriage and screw jack forward on flap tracks and engage front end of screw jack in actuator splined coupling.

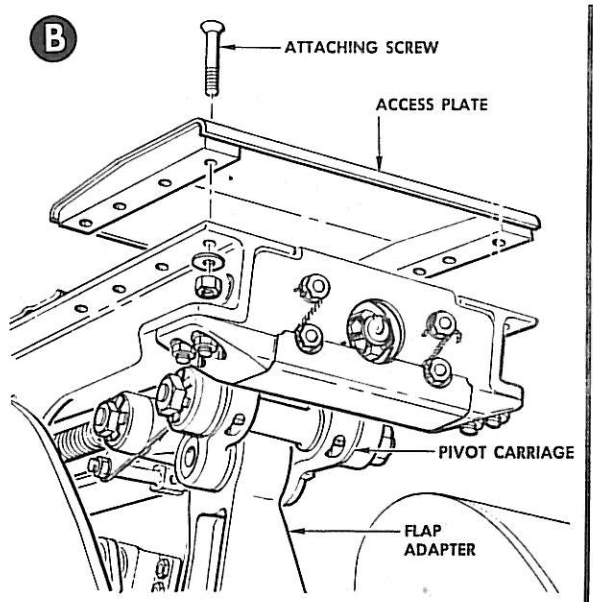
(4) Position screw jack thrust bearing housing on aft end of flap track assembly and install 12 mounting bolts.

(5) Disconnect torque tube from each side of screw jack actuator and rotate screw jack to align bolt holes in pivot carriage bushings with bolt hole in flap adapter pivot carriage bearing (refer to Removal/Installation - Flap Drive Torque Tubes).

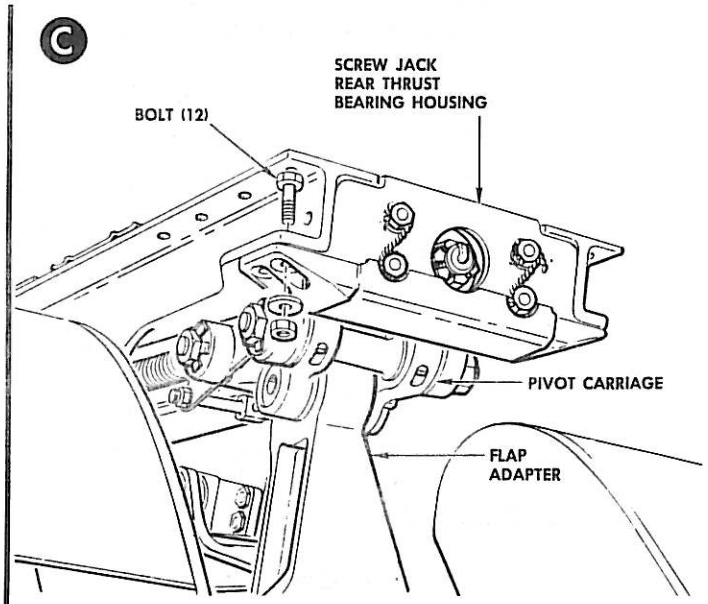




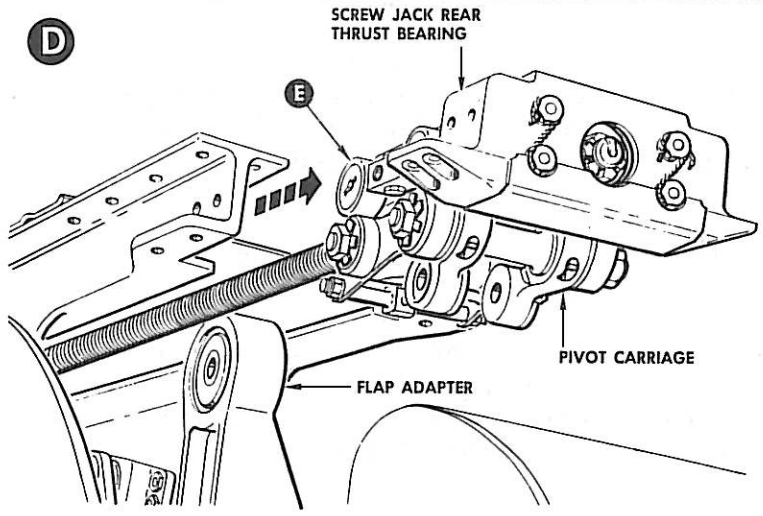
PIVOT CARRIAGE ATTACHMENT



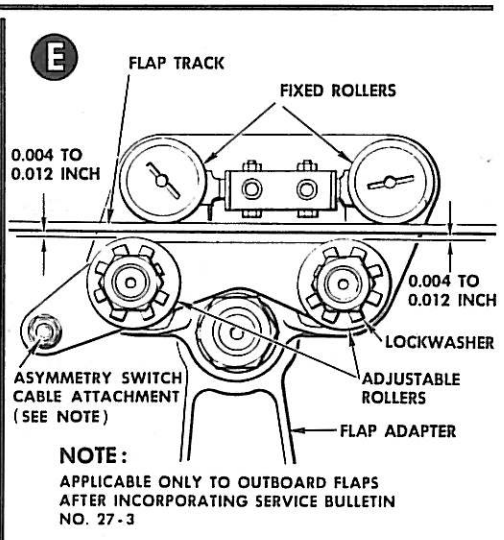
ACCESS PLATE REMOVAL



THRUST BEARING ATTACHMENT



SCREW JACK REMOVAL



PIVOT CARRIAGE ADJUSTMENT

30.02.27.157 B

(6) Install bolts attaching flap adapters to pivot carriages disconnected in step B. (2).

(7) Reinstall torque tube on each side of screw jack actuator.

(8) Manually push up on flap trailing edge so pivot carriage upper rollers are tight against flap track upper surface.

(9) Check clearance between pivot carriage lower rollers and flap track lower surface. Clearance must be not less than 0.004 or more than 0.012 inch. If clearance is not within tolerance, adjust pivot carriage lower rollers as follows:

(a) Bend back tabs on lockwashers and remove nuts, lockwashers, washers, and lower rollers. Remove eccentric bushing locks and adjust eccentric bushings to obtain correct clearance.

(b) Install rollers, eccentric bushing locks, washers, lockwashers, and nuts. Bend lockwasher tabs to safety nuts.

NOTE: Rollers must turn freely after torquing nuts.

(10) Install 8 bolts and mount plate on aft upper surface of flap track assembly.

(11) If installing an outboard flap inboard or outboard screw jack on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, connect individual flap asymmetry switch cable to pivot carriage and adjust individual flap asymmetry switch cables per 27-4-0, paragraph 1.E.

NOTE: If an outboard flap outboard screw jack has been replaced, check flap drive asymmetry switch rigging per 27-4-13, step 1.D.(2), and adjust switch as necessary.

(12) Align flap carriages (refer to 27-4-0, paragraph 1.C.).

(13) Check flap control system operation (refer to 27-4-0, Adjustment/ Test Flap Control System Functional Test).

NOTE: If a flap screw jack only has been replaced and no other rigging or adjustment has been changed, check flap control system operation 27-4-0, steps 2.E.(14), 2.E.(15), and paragraph 2.H. If an outboard flap outboard screw jack has been replaced, perform 27-4-0, steps 2.F.(1) through 2.F.(9) in addition to preceding steps. If an inboard or outboard screw jack has been replaced on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, perform 27-4-0, steps 2.F.(10) through 2.F.(14) in addition to applicable preceding steps.

WING FLAP PIVOT CARRIAGES - MAINTENANCE PRACTICES

1. Removal/Installation - Wing Flap Pivot Carriages (see Figure 201)

   A. Equipment Required. None.

   B. Remove Wing Flap Pivot Carriage.

      (1) Remove flap screw jack from flap track assembly (refer to Removal/Installation - Wing Flap Screw Jacks).

      (2) Loosen four nuts on carriage spacers at lower rollers.

      (3) If removing an outboard flap inboard or outboard pivot carriage on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, disconnect flap asymmetry switch cable at pivot carriage.

      (4) Spread sections of carriage apart and remove carriage from trunnions on screw jack ball nut.

   C. Install Wing Flap Pivot Carriage.

      (1) Loosen four nuts on carriage spacers at lower rollers and position carriage sections on ball nut trunnions.

      (2) Check that rollers are set far enough apart to allow installation of carriage on upper flap tracks. If not, remove nuts, lock washers, washers, and lower rollers from carriage spacers.

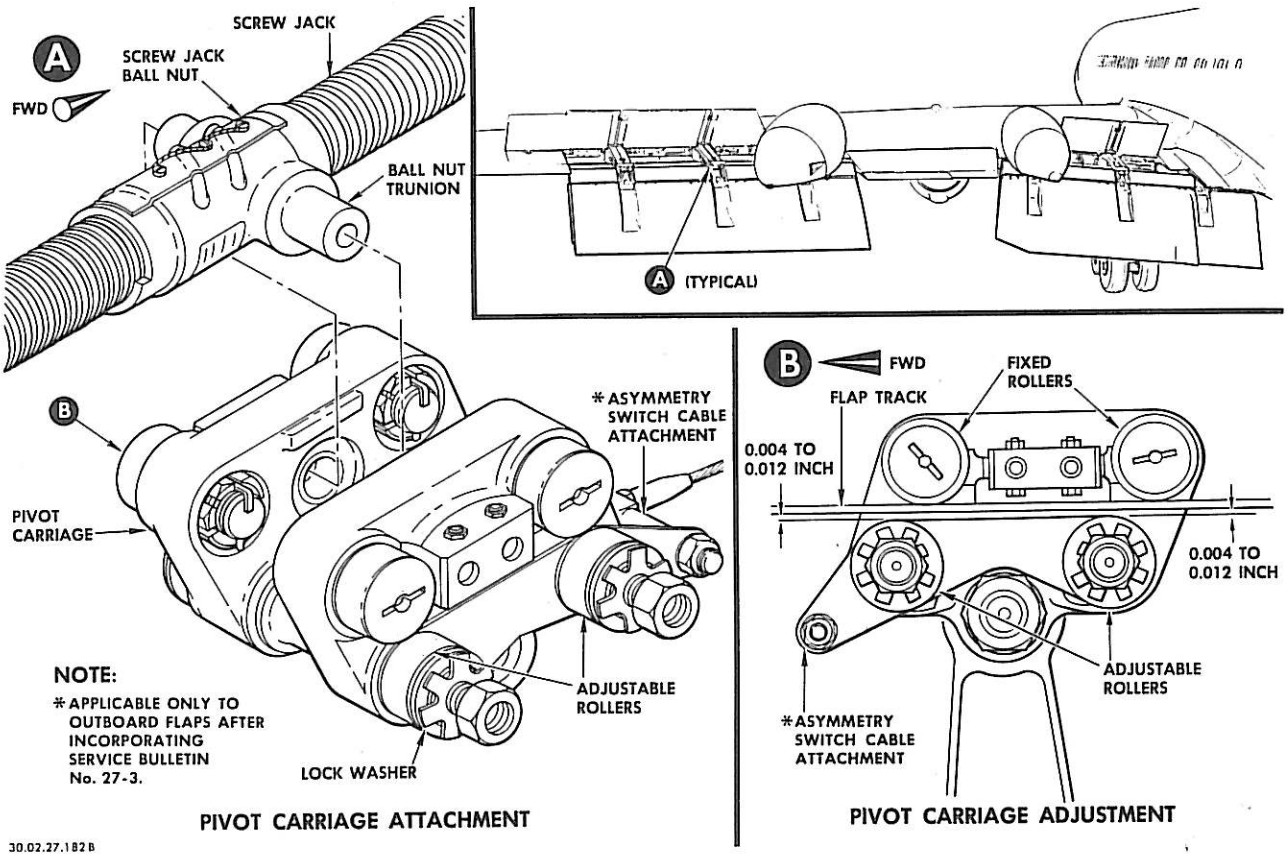
      (3) Detach eccentric lock and adjust eccentric bushings to increase space between upper and lower rollers.

      (4) Install lower rollers but do not safety nuts until screw jack has been installed and roller-to-track clearance adjusted.

      (5) Install flap screw jack (refer to Removal/Installation - Wing Flap Screw Jacks).

      (6) If installing an outboard flap inboard or outboard pivot carriage on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, connect individual flap asymmetry switch cable at pivot carriage and adjust individual flap asymmetry switch cables per 27-4-0, paragraph 1.E.

      (7) Align flap carriages (refer to 27-4-0, paragraph 1.C.).


A
SCREW JACK
SCREW JACK BALL NUT
FWD
BALL NUT TRUNION
A (TYPICAL)
B
FWD
FIXED ROLLERS
FLAP TRACK
0.004 TO 0.012 INCH
0.004 TO 0.012 INCH
*ASYMMETRY SWITCH CABLE ATTACHMENT
PIVOT CARRIAGE
ADJUSTABLE ROLLERS
LOCK WASHER
NOTE:
*APPLICABLE ONLY TO OUTBOARD FLAPS AFTER INCORPORATING SERVICE BULLETIN No. 27-3.
*ASYMMETRY SWITCH CABLE ATTACHMENT
ADJUSTABLE ROLLERS
PIVOT CARRIAGE ATTACHMENT
PIVOT CARRIAGE ADJUSTMENT
30.02.27.182 B

FLAP SCREW JACK ACTUATORS - MAINTENANCE PRACTICES

1. Removal/Installation - Flap Screw Jack Actuators (see Figure 201)

A. Equipment Required. None.

B. Remove Flap Screw Jack Actuator.

(1) Remove screw jack from flap track assembly from which actuator is to be removed (refer to 27-4-3, Removal/Installation - Wing Flap Screw Jacks).

(2) Disconnect torque tube from each side of actuator to be removed (refer to 27-4-11, Removal/Installation - Flap Drive Torque Tubes).

(3) Remove four bolts attaching screw jack actuator to flap tracks.

(4) Slide actuator aft, rotate 90 degrees, and remove from between flap tracks.

C. Install Flap Screw Jack Actuator.

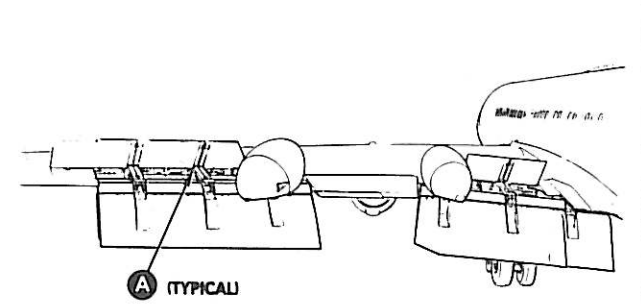
(1) Position screw jack actuator and install four mounting bolts attaching actuator to flap tracks.

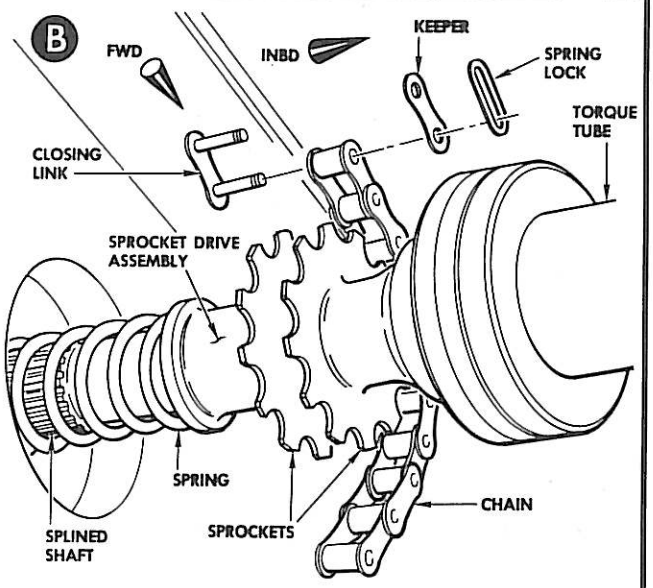
(2) Install screw jack (refer to 27-4-3, Removal/Installation - Wing Flap Screw Jacks).

(3) Reinstall torque tube on each side of screw jack actuator (refer to 27-4-11, Removal/Installation - Flap Drive Torque Tubes).

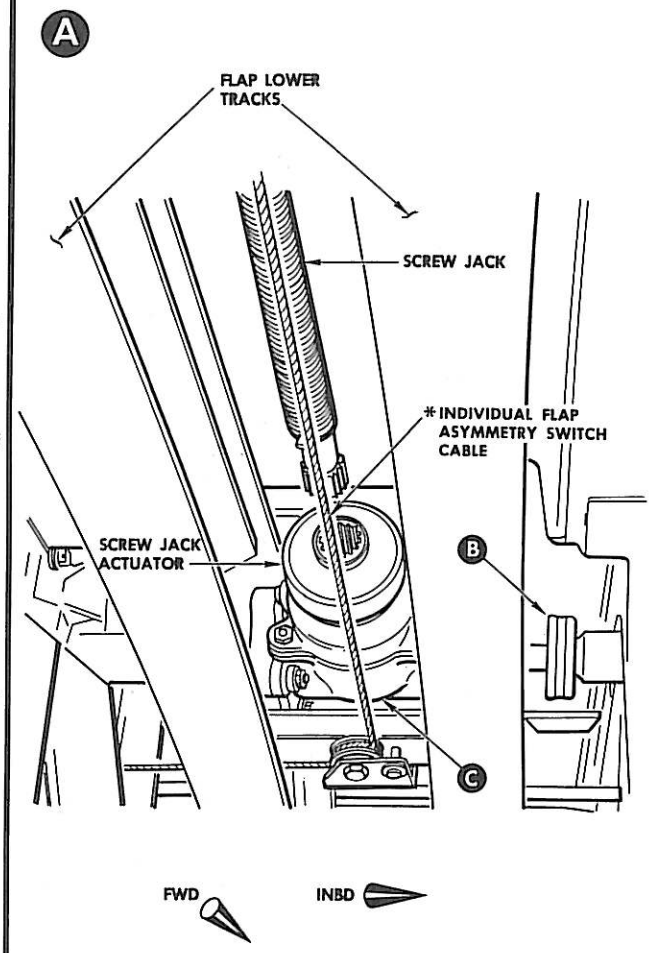
(4) Check flap control system operation (refer to 27-4-0, Adjustment/Test Flap Control System Functional Test).

NOTE: If a flap screw jack actuator only has been replaced and no other rigging or adjustment has been changed, check flap control system operation per 27-4-0, steps 2.E.(14), 2.E.(15), and paragraph 2.H. If an outboard flap outboard screw jack actuator has been replaced, perform 27-4-0, steps 2.F.(1) through 2.F.(9) in addition to preceding steps. If an inboard or outboard screw jack actuator has been replaced on any flap on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, perform 27-4-0, steps 2.F.(10) through 2.F.(14) in addition to applicable preceding steps.

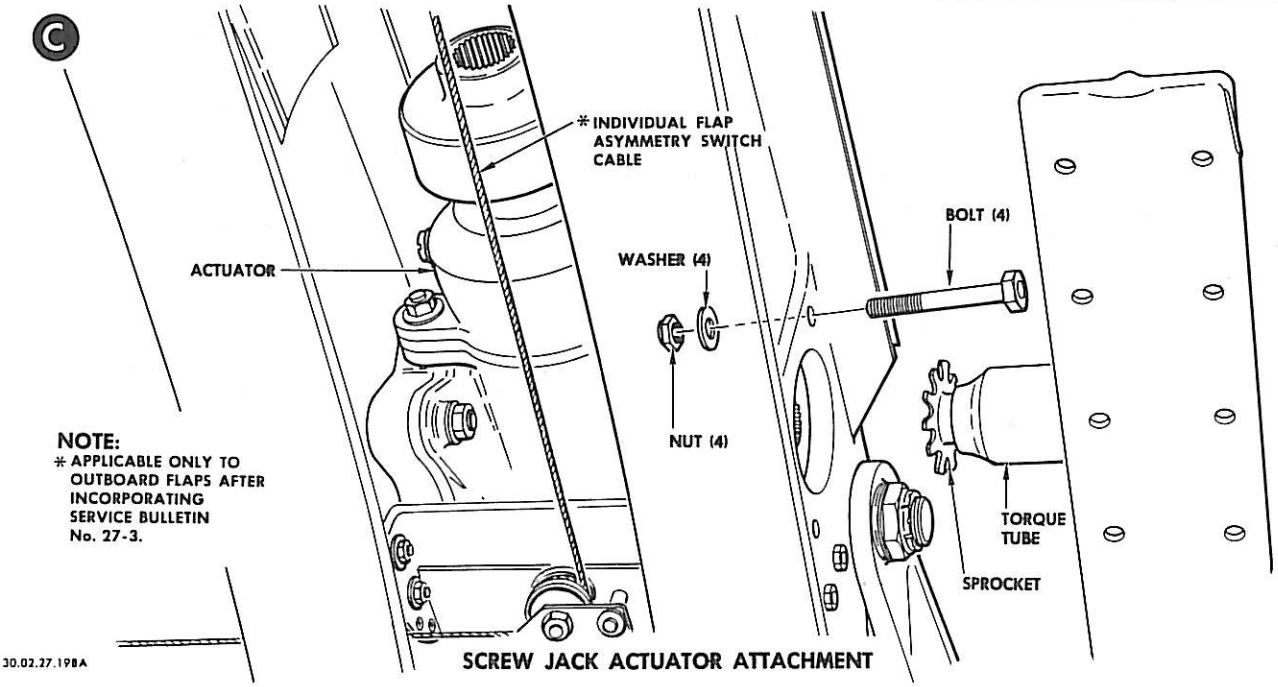




QUICK DISCONNECT (TYPICAL)



SCREW JACK ACTUATOR (TYPICAL)



SCREW JACK ACTUATOR ATTACHMENT

1. Removal/Installation - Outboard Flap Center or Outboard Track or Inboard Flap Center or Inboard Track (see Figure 201)

A. Equipment Required.

(1) External source of hydraulic power.

(2) External source of electrical power.

(3) Spoiler actuator lock No. 22J-115.

B. Remove Outboard Flap Center or Outboard Track or Inboard Flap Center or Inboard Track.

(1) Connect external source of electrical power and close FLAP ASYM CONT circuit breaker on main circuit breaker panel (refer to Chapter 24, ELECTRICAL POWER).

(2) Check that FLAP PWR SELECT switch is positioned on NORMAL NO. 1 and that flap control lever setting corresponds roughly with position of flaps.

(3) Connect external source of hydraulic power to airplane and pressurize No. 1 and No. 2 hydraulic systems (refer to Chapter 29, HYDRAULIC POWER).

CAUTION: DO NOT OPERATE FLAPS WHEN BOTH HYDRAULIC SYSTEMS ARE PRESSURIZED UNLESS ELECTRICAL POWER IS APPLIED TO THE AIRPLANE, AND THE "FLAP ASYM CONT" CIRCUIT BREAKER IS CLOSED.

(4) Actuate flap control lever and lower flaps to "full down" position.

(5) Actuate speed brake lever and raise spoilers to "full up" position.

(6) Install spoiler actuator lock No. 22J-115 at each pair of spoiler actuators to keep spoilers from closing.

(7) Depressurize hydraulic systems (refer to Chapter 12, SERVICING).

(8) Disconnect flap carriages, of track to be removed, from flap adapter.

(9) Disconnect torque tube from each side of actuator in track to be removed (refer to Removal/Installation - Flap Drive Torque Tubes).

NOTE: If removing outboard flap outboard track, remove flap drive asymmetry switch (refer to 27-4-13, Removal/Installation Flap Drive Asymmetry Switch Assembly).

(10) If removing an outboard flap outboard track on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, disconnect individual flap asymmetry cable at pivot carriage. Remove cable from pulley below actuator.

(11) Take out four track mounting bolts, slide main carriage well forward, and remove flap track through space between flap and spoiler.

C. Install Outboard Flap Center or Outboard Track or Inboard Flap Center or Inboard Track.

(1) Install main carriage on lower curved flap track (refer to Removal/Installation - Wing Flap Main Carriages).

(2) Roll main carriage well forward and feed track into position through opening between flap and spoiler. Rotate screw jack and position pivot carriage about three inches from aft end of track.

(3) Insert four bolts attaching flap track to flap fittings on structure and check side clearance between track lugs and fittings.

(4) Shim space on each side of track lugs as necessary to limit clearance to 0.005 inch.

(5) Install washers and nuts on mounting bolts and torque to between 80 and 100 inch-pounds.

(6) Rotate screw jack as necessary to align bolt hole in flap adapter pivot carriage bearing with bolt holes in pivot carriage and install bolt connecting pivot carriage to flap adapter.

(7) Adjust position of main carriage to align bolt holes in main carriage bearings with bolt holes in flap adapter main carriage fittings and install main carriage on flap adapter. Refer to 27-4-1, Removal/Installation - Wing Trailing Edge Flaps for detailed instructions covering main carriage installation on flap adapter.

(8) Check that space between aft main carriage roller and emergency stop corresponds to spaces between aft rollers and emergency stops of adjacent flap tracks. If not, rotate screw jack of track being installed to obtain proper spacing.

(9) Install torque tube on each side of actuator in track being installed (refer to Removal/Installation - Flap Drive Torque Tubes).

NOTE: If installing an outboard flap outboard track, install flap drive asymmetry switch (refer to 27-4-13, Removal/Installation Flap Drive Asymmetry Switch Assembly).

(10) If installing an outboard flap outboard track on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) route individual flap asymmetry switch cable around pulley below actuator and connect to pivot carriage.

(11) Align flap carriages (refer to 27-4-0, paragraph 1.C.).

(12) If installing an outboard flap outboard track on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, adjust individual flap asymmetry switch cables per 27-4-0, paragraph 1.E.

(13) Check flap control system operation (refer to 27-4-0, Adjustment/Test Flap Control System Functional Test).

NOTE: If a flap track only has been replaced and no other rigging or adjustment has been changed, check flap control system operation per 27-4-0, steps 2.E.(14), 2.E.(15) and paragraph 1.F. If an outboard flap outboard track has been replaced, perform 27-4-0, steps 2.F.(1) through 2.F.(9) in addition to preceding steps. If an inboard or outboard track has been replaced on any flap on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, perform 27-4-0, steps 2.F.(10) through 2.F.(14) in addition to applicable preceding steps.

2. Removal/Installation - Outboard Flap Inboard Track or Inboard Flap Outboard Track (see Figure 201)

A. Equipment Required. None.

B. Remove Outboard Wing Flap Inboard Track or Inboard Wing Flap Outboard Track.

(1) Remove flap attached to track to be removed (refer to Removal/Installation - Wing Flaps).

(2) Open shroud doors on under surface of wing in line with flap track to be removed.

(3) Disconnect torque tube from each side of flap track to be removed.

(4) If removing an outboard flap inboard track, disconnect individual flap asymmetry switch cable at flap pivot carriage and remove from pulley below flap actuator.

(5) Remove four track mounting bolts and move track away from wing.

C. Install Outboard Flap Inboard Track or Inboard Flap Outboard Track.

(1) Position flap track and insert four mounting bolts. Using laminated steel washers, shim spaces between track mounting lugs and fittings on structure as necessary to limit clearance to 0.005 inch before installing nuts.

(2) Install nuts on mounting bolts and torque to between 80 and 100 inch-pounds.

(3) Rotate screw jack and set pivot carriage in same relative position as pivot carriages on adjacent tracks are located.

(4) Install main carriage on flap track. Adjust carriage and install flap per 27-4-2, steps C.(3) through C.(6).

(5) Deleted.

(6) Check that clearance between main carriage aft rollers and emergency stops on track being installed is the same as the clearance between the main carriage aft rollers and emergency stops on remaining flap tracks. If not, rotate screw jack of track being installed as necessary to obtain correct clearance.

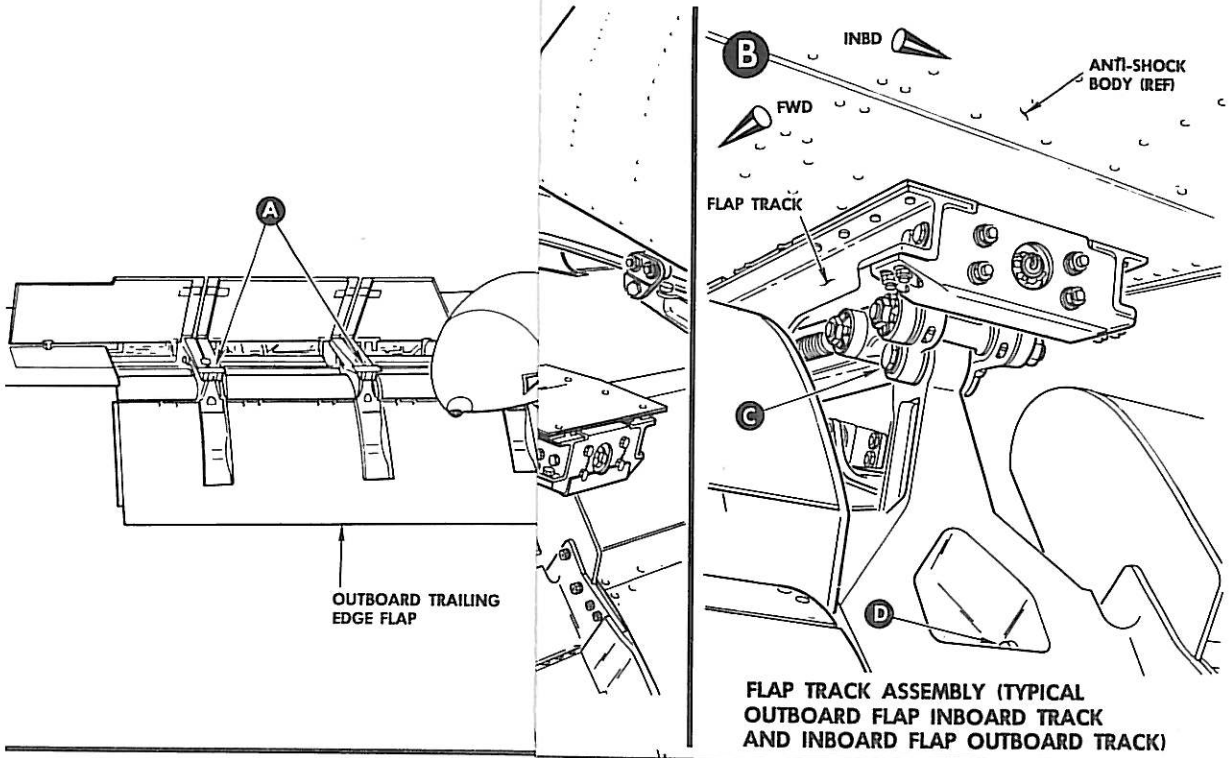
(7) Connect torque tube to each side of screw jack actuator.

(8) If installing an outboard flap inboard track on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished, route individual flap asymmetry switch cable around pulley below actuator and connect to pivot carriage.

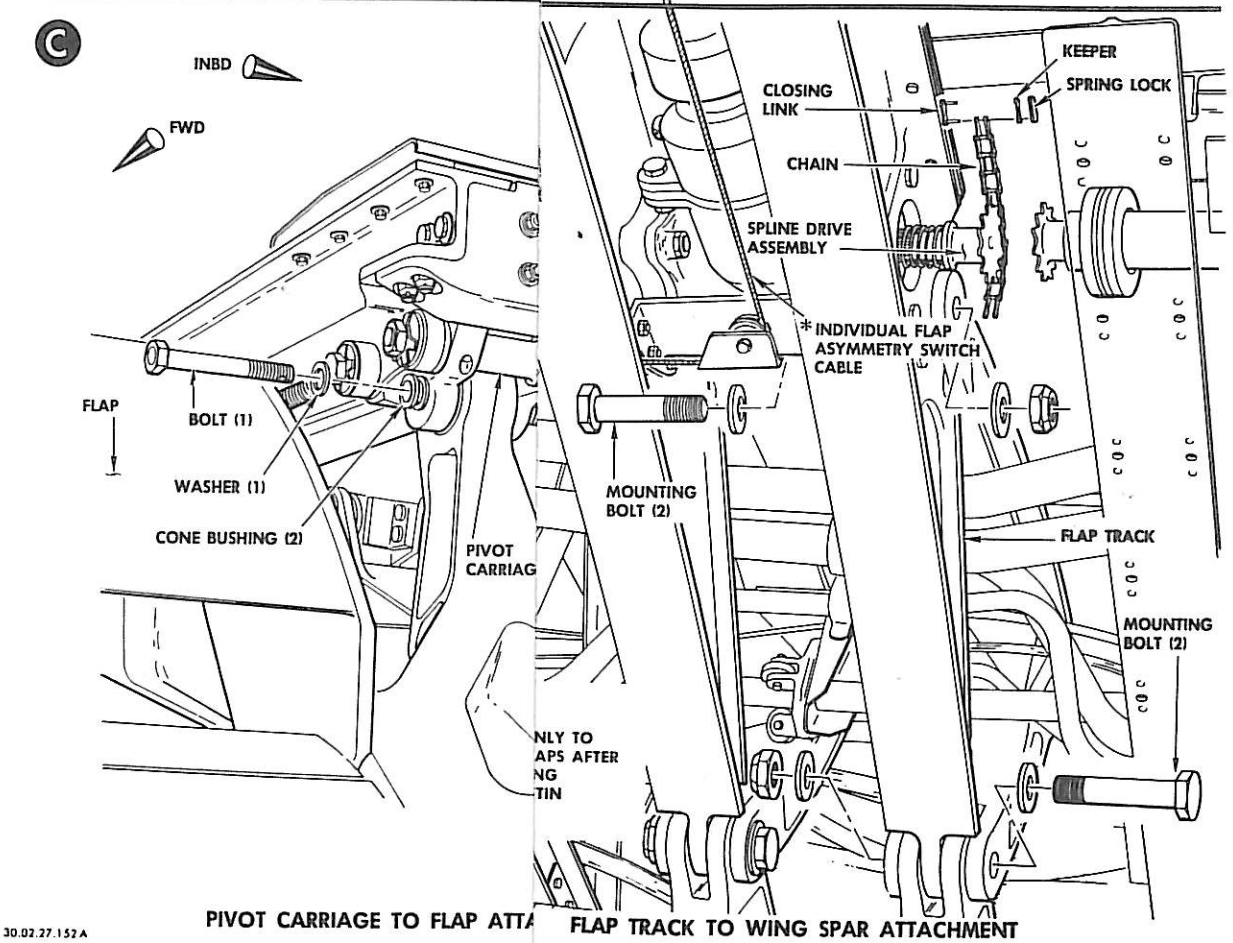
(9) Align flap carriages (refer to 27-4-0, paragraph 1.C.).

(10) Check flap control system operation (refer to 27-4-0, Adjustment/Test Flap Control System Functional Test).

NOTE: If an inboard flap outboard track or an outboard flap inboard track only has been replaced and no other rigging or adjustment has been changed, check flap control system operation per 27-4-0, steps 2.E.(14), 2.E.(15), and paragraph 1.F., in sequence listed. Perform steps 2.F.(10) through 2.F.(14) on airplanes with Service Bulletin No. 27-3 (Individual Flap Asymmetry Switches) accomplished.



FLAP TRACK ASSEMBLY (TYPICAL OUTBOARD FLAP INBOARD TRACK AND INBOARD FLAP OUTBOARD TRACK)



PIVOT CARRIAGE TO FLAP ATTA

FLAP TRACK TO WING SPAR ATTACHMENT

30.02.27.152A

FLAP CONTROL LEVER ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation Flap Control Lever Assembly (see 27-0, Figure 201)

A. General.

The wing flap control lever is mounted on a shaft in the pilot's pedestal on a common shaft with the fuel shut-off levers, power control levers, and spoiler speed brake control lever. To remove any of these levers, it is necessary to remove the control lever installation from the pedestal. Refer to 27-0, Removal/Installation Control Lever Assemblies.

FLAP CENTRAL DRIVE GEARBOX ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation - Flap Central Drive Gearbox Assembly (see Figure 201)

A. Equipment Required.

(1) Container for draining disconnected hydraulic lines.

(2) Two shop-fabricated "Go" gages, one to measure minimum gap of two screw jack turns or 0.58 inch between aft ball nut stop and aft screw jack stop, the other to measure minimum gap of 1.143 inches between forward axle of pivot carriage and housing of screw jack coupling.

(3) Index pin 22-J107-2.0.

B. Remove Flap Central Drive Gearbox Assembly.

(1) Open WARN HORN circuit breaker on main circuit breaker panel.

(2) Gain access to hydraulic compartment and disconnect electrical plug from flap warning switch assembly.

(3) Disconnect elevator downspring flex shaft from drive unit on left side of central drive gearbox.

(4) Disconnect flap drive torque tube on each side of gearbox (refer to Removal/Installation - Flap Drive Torque Tubes).

(5) Disconnect lower end of aft cable quadrant push-pull rod.

(6) Check that hydraulic systems are not pressurized and disconnect hydraulic lines from flap selector valve and drain lines from flap motors.

(7) Remove nine bolts attaching gearbox assembly to structure.

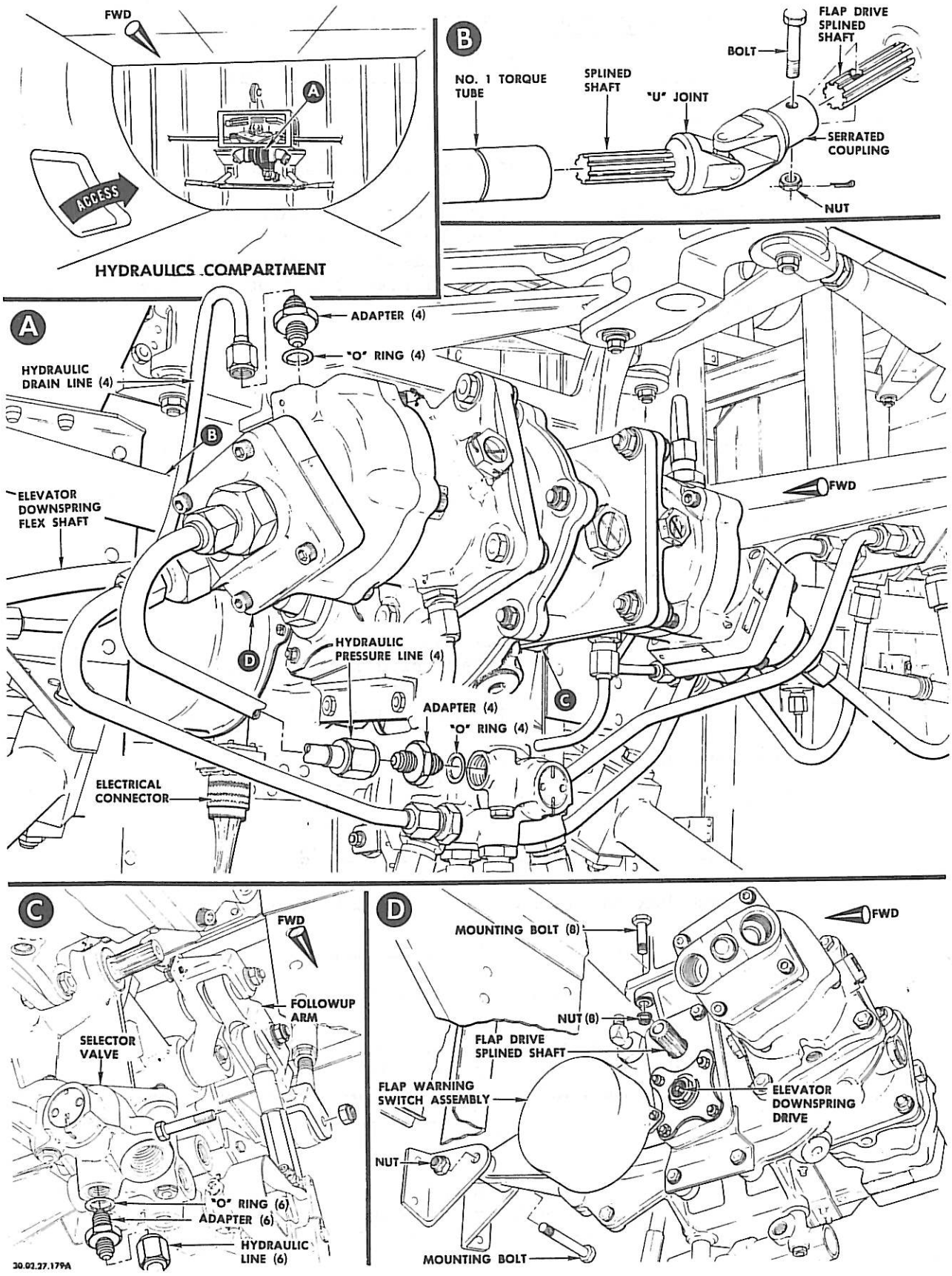
(8) Remove gearbox and wipe up any spilled hydraulic fluid.

C. Install Flap Central Drive Gearbox Assembly.

(1) Position gearbox assembly and install nine mounting bolts.

(2) Rotate flap torque tubes by hand and raise flaps to "full up" position. Check that screw jack and ball nut forward stops on each screw jack are at least 2 turns from making contact. Upper surface of inboard ends of inboard flaps should be within 0.50 (±0.12) inch of under surface of wing fillet.

NOTE: Gap of 1.143 inches measured by "Go" gage between forward axle of pivot carriage and housing of screw jack coupling is equivalent to 2 screw jack turns.



Wing Flap Central Drive Gearbox Assembly
Installation
Figure 201

(3) Place flap control lever in 0° detent and check that aft cable quadrant at station 972 has contacted "up" stop.

(4) Rotate gearbox output shafts to position followup arm in UP position as indicated by pointer on followup arm.

CAUTION: DRIVING FOLLOWUP ARM MORE THAN 0.20 INCH BEYOND "UP" OR "DOWN" INDEX ON GEARBOX HOUSING WILL RESULT IN DAMAGE TO INTERNAL GEARS.

(5) Insert index pin in flap selector valve arm, adjust aft quadrant push-pull rod as necessary to align bolt hole in lower end of push-pull rod with bolt hole in followup arm, and install connecting bolt. Remove index pin from valve arm.

(6) Install hydraulic lines on selector valve and flap motors.

(7) Connect external source of hydraulic power to airplane and pressurize both hydraulic systems (refer to Chapter 29, HYDRAULIC POWER).

NOTE: Flap drive motors will actuate selector valve to "null" position.

(8) Without changing setting of central drive gearbox shafts, install flap drive torque tube on each side of central drive gearbox (refer to Removal/Installation - Flap Drive Torque Tubes).

CAUTION: CHECK THAT GAP BETWEEN LH U-JOINT AND FACE OF GEARBOX DOES NOT EXCEED 0.15 INCH AND THAT GAP BETWEEN RH U-JOINT AND GEARBOX FACE DOES NOT EXCEED 0.60 INCH.

(9) Install elevator downspring drive on LH side of gearbox (refer to Removal/Installation - Elevator Downspring Drive).

(10) Bleed flap system and check for hydraulic leaks (refer to Adjustment/Test - Flap Control System Bleeding Procedure).

CAUTION: DURING FIRST CYCLE OF OPERATION, APPROACH TRAVEL LIMITS CAUTIOUSLY. CHECK THAT LOWER AFT MAIN CARRIAGE ROLLERS DO NOT COME CLOSER THAN 0.70 INCH TO EMERGENCY DOWN STOPS AND THAT SCREW JACK STOPS ARE AT LEAST TWO TURNS FROM MAKING CONTACT WITH BALL NUT STOPS WHEN FLAPS ARE FULLY RETRACTED.

(11) Connect electrical plug to warning switch assembly.

(12) Check flap operation (refer to 27-4-0, Adjustment/Test Flap Control System Functional Test and Adjustment/Test Flap Warning Horn Circuit).

NOTE: If the flap central drive gearbox assembly only has been replaced and no other rigging or adjustment has been changed, check flap operation per 27-4-0, paragraphs 2.G. and 3.B.

(13) Check elevator downspring operation (refer to 27-5-0, Adjustment/Test Elevator Control System Functional Test).

NOTE: If the flap central drive gearbox only has been replaced and no other rigging or adjustment has been changed, check elevator downspring operation per 27-5-0, paragraph 2.I.

FLAP SELECTOR VALVE - MAINTENANCE PRACTICES

1. Removal/Installation - Flap Selector Valve (see Figure 201)

A. Equipment Required.

(1) External source of hydraulic power.

(2) Two shop-fabricated "Go" gages, one to measure minimum gap of two screw jack turns or 0.58 inch between aft ball nut stop and aft screw jack stop, the other to measure minimum gap of 1.143 inches between forward axle of pivot carriage and housing of screw jack coupling.

(3) Container to catch spilled hydraulic fluid.

B. Remove Flap Selector Valve.

(1) Check that hydraulic systems are not pressurized.

(2) Disconnect lower end of push-pull link from flap selector valve arm.

(3) Remove three bolts attaching valve to central drive gearbox.

(4) Break torque on all valve tubing nuts. Disconnect all lines from valve except the two vertical lines extending to individual tee fittings below valve.

(5) Remove the two vertical lines by backing off both upper and lower tubing nuts and rotating and/or shifting valve to one side. As soon as valve is free, cap both lower tee fittings.

(6) Remove valve from airplane.

C. Install Flap Selector Valve.

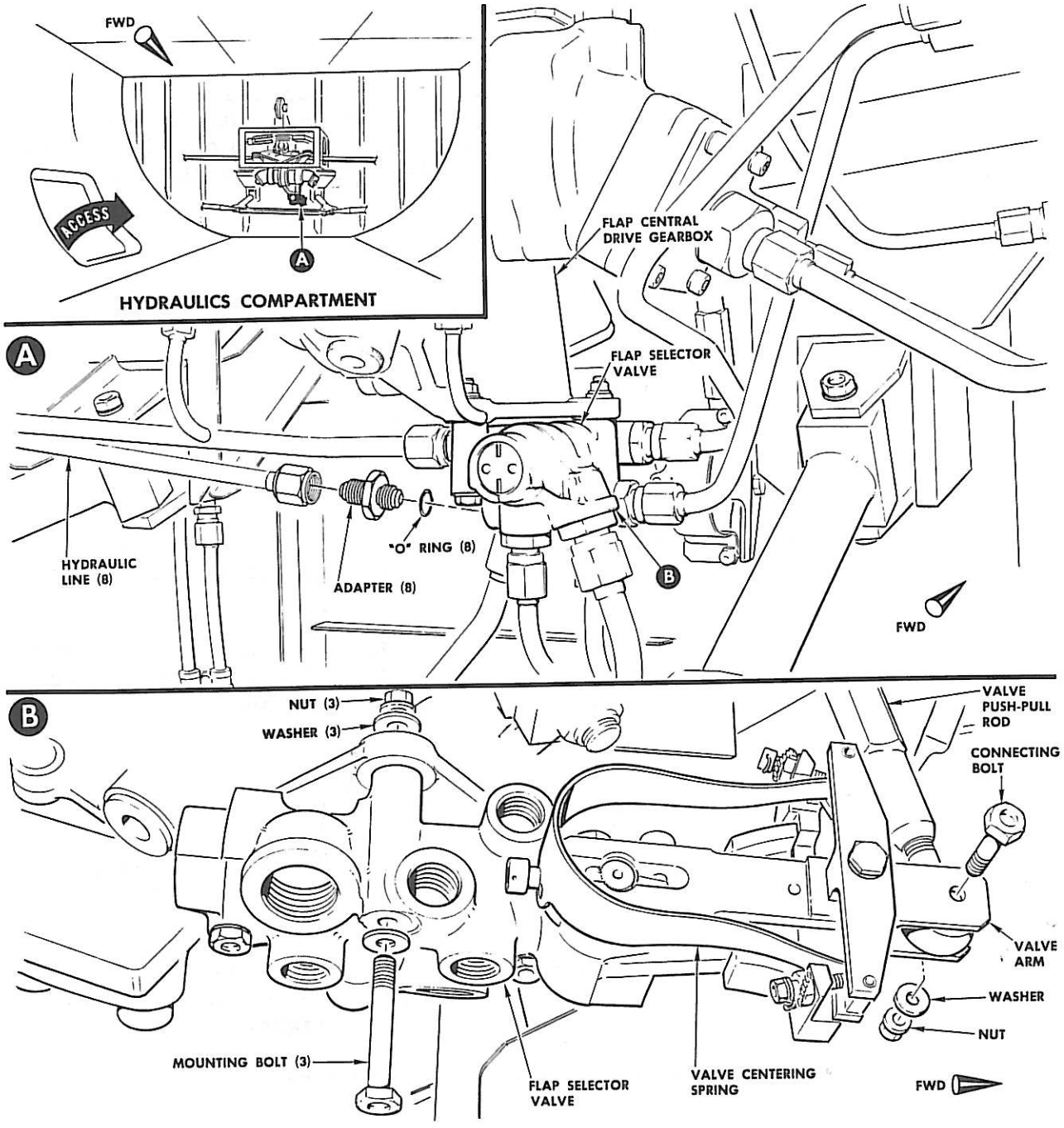
(1) Clean mating surfaces of gearbox and selector valve mounting pads and apply one coat of wet unthinned zinc chromate primer per MIL-P-8585.

(2) Position selector valve on gearbox mounting pad, remove caps from lower tee fittings, and install both vertical hydraulic lines. Tighten all nuts on vertical lines finger tight.

(3) Install three valve mounting bolts and secure.

(4) Install remaining hydraulic lines and torque all tubing nuts.

(5) Disconnect flap drive torque tube from each side of central drive gearbox (refer to Removal/Installation - Flap Drive Torque Tubes).



Wing Flap Selector Valve Installation
Figure 201

(6) If flaps are not fully retracted, rotate torque tubes in each wing manually to retract flaps. Use "Go" gage to check that screw jack stops on inboard flaps are at least 2.00 turns from making contact with stops on screw jack ball nuts.

(7) Place flap control lever in 0° detent and check that aft cable quadrant "up" stops are making contact and that pointer on followup arm is aligned with UP index on gearbox housing.

(8) Install bolt connecting lower end of push-pull link to selector valve arm.

(9) Connect external source of hydraulic power to airplane and pressurize both hydraulic systems (refer to Chapter 29, HYDRAULIC POWER).

NOTE: Flap drive motors will actuate selector valve to "null" position.

(10) Install flap drive torque tube on each side of central drive gearbox.

CAUTION: CHECK THAT GAP BETWEEN LH U-JOINT AND FACE OF GEARBOX DOES NOT EXCEED 0.15 INCH AND THAT GAP BETWEEN RH U-JOINT AND GEARBOX FACE DOES NOT EXCEED 0.60 INCH.

(11) Bleed flap system (refer to Adjustment/Test - Flap Control System Bleeding Procedure).

CAUTION: DURING FIRST CYCLE OF FLAP OPERATION, APPROACH TRAVEL LIMITS CAUTIOUSLY. CHECK THAT LOWER AFT MAIN CARRIAGE ROLLERS DO NOT COME CLOSER THAN 0.70 INCH TO FLAP EMERGENCY STOPS AND THAT SCREW JACK STOPS ARE AT LEAST 2 TURNS FROM MAKING CONTACT WITH STOPS ON SCREW JACK BALL NUTS.

NOTE: If flap travel is not satisfactory, readjust the selector valve followup arm and/or the cable quadrant vertical push-pull rod as necessary. Lengthening the followup arm decreases overall travel, while shortening the followup arm increases overall travel. Lengthening the vertical push-pull rod increases flap down travel and decreases flap up travel, while shortening the vertical push-pull rod decreases down travel and increases up travel.

CAUTION: NEVER DRIVE FOLLOWUP ARM MORE THAN 0.20 INCH BEYOND "UP" OR "DN" PADS OR FOLLOWUP GEARS WILL BE STRIPPED.

(12) Test flap system (refer to Adjustment/Test - Flap Control System Functional Test).

NOTE: If the flap selector valve only has been replaced and no other rigging or adjustment has been changed, no further rigging or adjustment is required. Install protractor No. 22-18000-901 on LH inboard flap and check selector valve and flap travel per 27-4-0, steps 2.E.(14) and 2.E.(15), and paragraph 2.G.

FLAP DRIVE MOTORS - MAINTENANCE PRACTICES

1. Removal/Installation - Flap Drive Motors (see Figure 201)

   A. Equipment Required.

      (1) Container to catch spilled hydraulic fluid.

   B. Remove Flap Drive Motor.

      (1) Check that hydraulic systems are not pressurized.

      (2) Disconnect two pressure and two drain lines from motor.

      (3) Drain lines in container and wipe up any spilled hydraulic fluid.

      (4) Remove four mounting bolts attaching motor to pad on main drive gearbox.

      (5) Remove flap drive motor.

   C. Install Flap Drive Motor.

      (1) Clean mounting pads on motor and gearbox.

      (2) Apply unthinned wet zinc chromate primer to mating surfaces of motor and gearbox per MIL-P-8585.

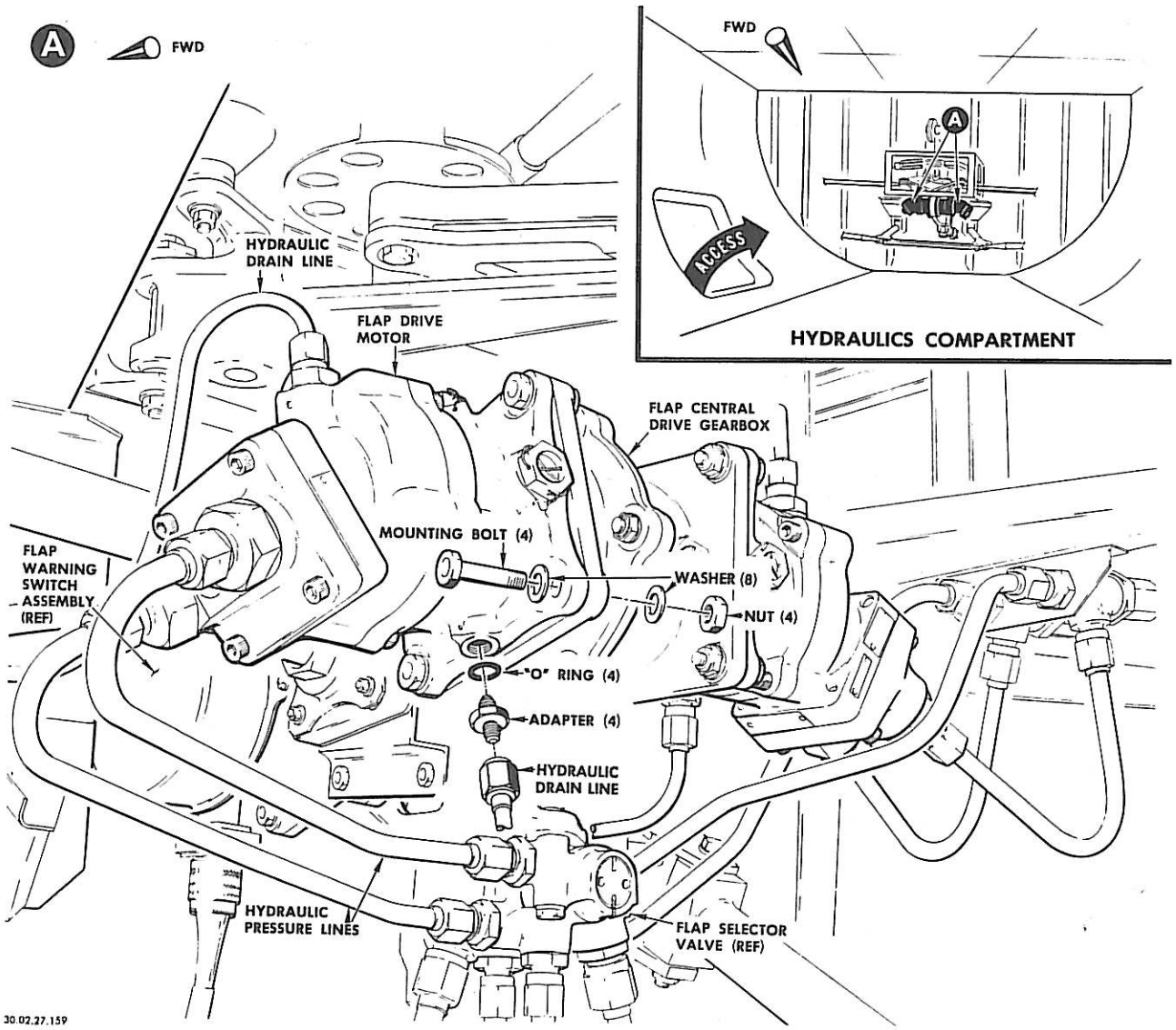
      (3) Position flap drive motor on mounting pad and install four mounting bolts.

      (4) Install two pressure and two hydraulic drain lines on motor.

      (5) Bleed flap hydraulic system and perform leak test (refer to 27-4-0, Adjustment/Test - Flap Control System Bleeding Procedure).

      (6) Test flap control system (refer to 27-4-0, Adjustment/Test - Flap Control System Functional Test).

      NOTE: If a flap drive motor only has been replaced and no other rigging or adjustment has been changed, check flap operation per 27-4-0, steps 2.E.(14) and 2.E.(15).



Wing Flap Drive Motors Installation
Figure 201

FLAP DRIVE TORQUE TUBES - MAINTENANCE PRACTICES

1. Removal/Installation - Flap Drive Torque Tubes (see Figure 201)

A. General.

(1) Some braces in the wing trailing edge are held in place with bolts and can be removed to expedite the removal and installation of certain flap drive torque tubes. However, all of the torque tubes in both wings can be removed and installed without removing any structural braces.

(2) Before installing any torque tube, apply a light coat of graphite grease, Specification MIL-G-7187 to each splined shaft and mating female serrated coupling.

(3) Before installing a new torque tube, position the flaps on both wings to "full down" position and set flap control lever in 50° detent.

NOTE: Aft rollers on flap main carriages should be 0.70 inch from making contact with emergency stops on aft ends of lower flap tracks.

(4) Procedures for removing and installing the flap drive units in the LH and RH wings are identical.

B. Equipment Required.

(1) Spacer blocks 0.70 inch thick to place behind main flap aft carriage rollers when locating flaps in "full down" position.

(2) Shop fabricated hook-shaped tool to install quick-disconnect flexible cover on sprocket couplings.

C. Disconnect Torque Tube Sprocket Coupling.

(1) Remove flexible cover from sprocket assembly.

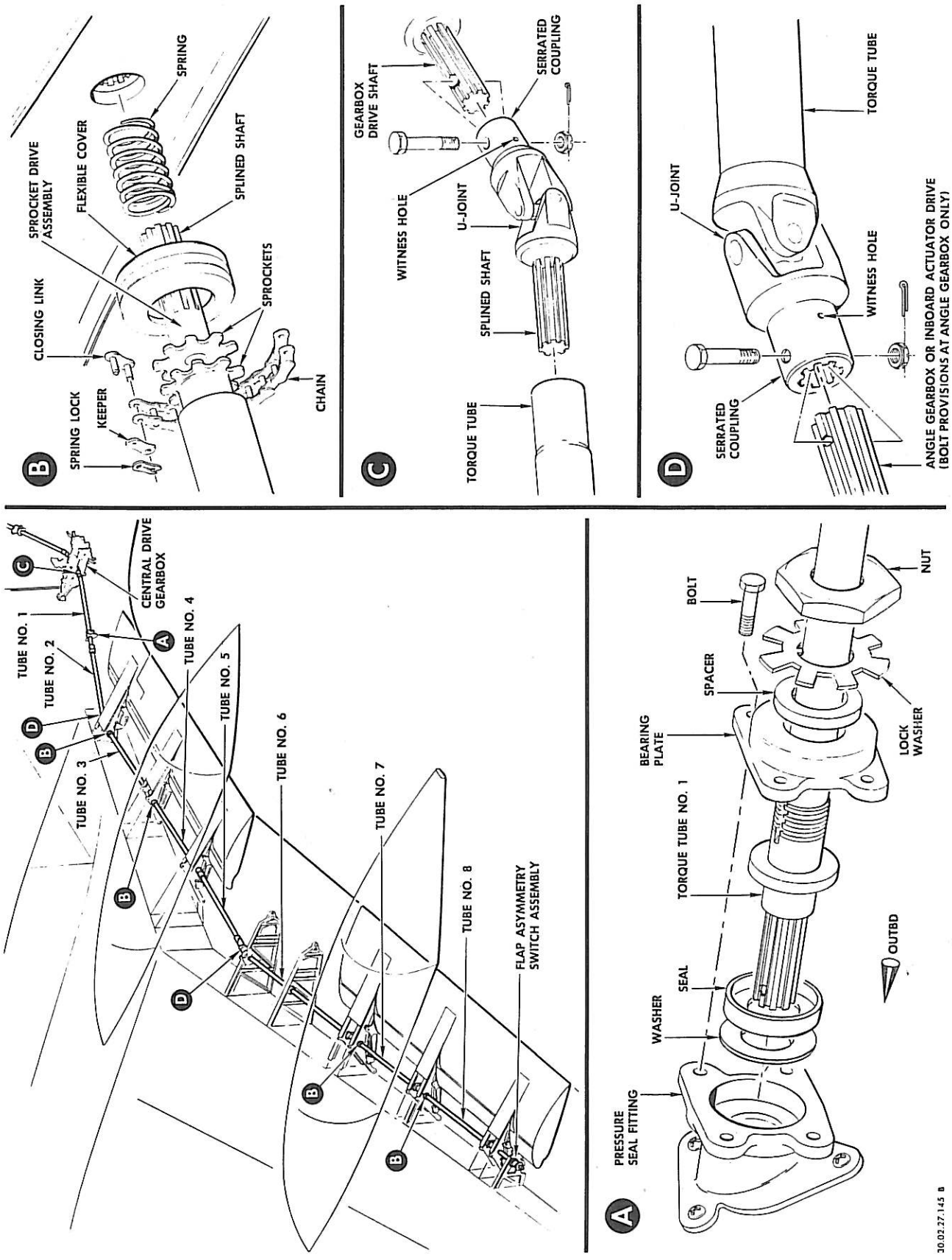
(2) Remove spring lock and keeper from closing link and slide link prongs out of adjacent links.

(3) Remove chain from sprocket and replace closing link, keeper, and spring lock for installation.

(4) Release spring compression slowly on preloaded drive sprocket and remove splined shaft from serrated drive.

D. Install Torque Sprocket Coupling.

(1) Slide flexible cover and spring over splined shaft of sprocket drive unit.


B
SPRING
FLEXIBLE COVER
SPLINED SHAFT
SPROCKET DRIVE ASSEMBLY
CLOSING LINK
SPROCKETS
SPRING LOCK
KEEPER
CHAIN
C
GEARBOX DRIVE SHAFT
SERRATED COUPLING
WITNESS HOLE
U-JOINT
SPLINED SHAFT
TORQUE TUBE
D
TORQUE TUBE
U-JOINT
WITNESS HOLE
SERRATED COUPLING
ANGLE GEARBOX OR INBOARD ACTUATOR DRIVE (BOLT PROVISIONS AT ANGLE GEARBOX ONLY)
CENTRAL DRIVE GEARBOX
TUBE NO. 1
TUBE NO. 2
TUBE NO. 3
TUBE NO. 4
TUBE NO. 5
TUBE NO. 6
TUBE NO. 7
TUBE NO. 8
FLAP ASYMMETRY SWITCH ASSEMBLY
A
PRESSURE SEAL FITTING
WASHER
SEAL
TORQUE TUBE NO. 1
BEARING PLATE
SPACER
BOLT
NUT
LOCK WASHER
OUTBD
30.02.27.145 B

(2) Insert splined shaft of sprocket drive unit into appropriate serrated drive.

(3) Position torque tube, align sprockets, and wrap chain around sprockets to hold them together.

(4) Insert prongs of closing link through holes in adjoining links and install keeper and spring lock.

(5) Using screw driver or shop fabricated tool, mount flexible cover on sprocket assembly.

E. Remove Flap Drive No. 1 Torque Tube.

(1) Gain access to hydraulic compartment and remove four bolts attaching bearing plate to pressure seal fitting mounted on fuselage wall at outboard end of torque tube.

(2) Straighten tabs on lockwasher and loosen nut on torque tube adjacent to bearing plate.

(3) Dislodge spacer ring adjacent to inner face of bearing and slide nut, washer, spacer ring, and bearing plate toward middle of torque tube.

(4) Remove bolt from torque tube U-joint just outboard of fuselage and disconnect U-joint from splined shaft.

(5) Remove bolt securing No. 1 torque tube U-joint to splined shaft on central drive gearbox in hydraulic compartment.

(6) Slide torque tube outboard, then slide U-joint outboard into torque tube to clear splined shaft on gearbox and remove U-joint.

(7) Slide torque tube inboard as far as possible and remove pressure seal and washer from pressure seal fitting over outboard end of torque tube.

(8) Slide torque tube outboard through pressure seal fitting far enough for inboard end to clear obstructions, and remove torque tube.

NOTE: Disconnect case drain line from flap motor to provide clearance for torque tube removal.

F. Install Flap Drive No. 1 Torque Tube.

(1) Gain access to hydraulic compartment.

(2) Slide spacer ring, bearing plate, lock washer, and nut over inboard end of torque tube.

(3) Slide outboard end of torque tube outboard through pressure seal fitting far enough for inboard end to clear obstructions.

(4) Slide torque tube inboard and position washer and pressure seal in pressure seal fitting over outboard end of torque tube.

(5) Slide tube outboard far enough to insert splined shaft of U-joint in inboard end of torque tube and position serrated coupling of U-joint on gearbox drive shaft.

(6) Position bearing against collar on torque tube, install spacer ring against bearing, position lock washer with center tab aligned with groove in torque tube bushing, tighten lock nut, and secure with lock washer tabs.

(7) Install four bolts attaching bearing plate to pressure seal fitting and secure with safety wire. Do not over-torque bolts.

(8) Install bolt securing U-joint coupling on gearbox splined shaft.

CAUTION: IF INSTALLING TORQUE TUBE ON LH SIDE OF GEARBOX, CHECK THAT GAP BETWEEN U-JOINT AND GEARBOX DOES NOT EXCEED 0.15 INCH. IF INSTALLING TORQUE TUBE ON RH SIDE OF GEARBOX, CHECK THAT GAP DOES NOT EXCEED 0.60 INCH. (IF U-JOINT COUPLING HAS A WITNESS HOLE, INSERT A PAPER CLIP OR LENGTH OF FINE WIRE TO DETERMINE THAT TORQUE TUBE IS POSITIONED FAR ENOUGH INBOARD.)

(9) Set flaps manually in "full down" position and check that aft rollers on flap main carriages are 0.70 inch from making contact with emergency stops on lower flap tracks.

(10) Install serrated coupling on No. 2 torque tube on splined shaft of No. 1 torque tube protruding through pressure seal in fuselage wall.

(11) Install bolt securing serrated coupling to splined end of No. 1 torque tube.

CAUTION: MAKE SURE THAT BOLT PASSES THROUGH HOLE IN TORQUE TUBE SPLINED END. (IF TORQUE TUBE HAS A WITNESS HOLE, INSERT A PAPER CLIP OR LENGTH OF FINE WIRE. WIRE SHOULD ENCOUNTER TORQUE TUBE SPLINED END.)

(12) Test flap system (refer to 27-4-0, Adjustment/Test - Flap Control System Functional Test).

NOTE: If a flap drive No. 1 torque tube only has been replaced and no other rigging or adjustment has been changed, check flap operation per 27-4-0, paragraph 2.D. and steps 2.E.(3), 2.E.(14) and 2.E.(15).

G. Remove Flap Drive No. 2 Torque Tube.

(1) Check that flaps are lowered to "full down" position.

(2) Remove bolt from torque tube U-joint just outboard of fuselage.

(3) Slide torque tube outboard into flap screw jack actuator drive far enough for U-joint sleeve to clear splined shaft protruding from pressure seal.

(4) Lower inboard end of torque tube, slide torque tube inboard to clear screw jack actuator drive, and remove torque tube from airplane.

H. Install Flap Drive No. 2 Torque Tube.

(1) Check that flaps in both wings are in "full down" position and that flap control lever is in 50° detent.

NOTE: Aft rollers on flap main carriages should be 0.70 inch from emergency stops on lower flap tracks.

(2) Position torque tube and slide outboard U-joint splined shaft into screw jack actuator drive.

(3) Align inboard U-joint sleeve with splined shaft protruding from pressure seal and slide sleeve over shaft.

(4) Install bolt securing inboard U-joint sleeve to splined shaft.

CAUTION: MAKE SURE THAT BOLT PASSES THROUGH HOLE IN SPLINED SHAFT. (IF U-JOINT HAS A WITNESS HOLE, INSERT A PAPER CLIP OR LENGTH OF FINE WIRE. WIRE SHOULD ENCOUNTER SPLINED SHAFT.)

(5) Test flap system (refer to 27-4-0, Adjustment/Test - Flap Control System Functional Test).

NOTE: If a flap drive No. 2 torque tube only has been replaced and no other rigging or adjustment has been changed, check flap operation per 27-4-0, paragraph 2.D. and steps 2.E.(3), 2.E.(14) and 2.E.(15).

I. Remove Flap Drive No. 5 Torque Tube.

(1) Open shroud doors on under surface of wing in line with No. 5 torque tube and lower flaps manually to "full down" position.

(2) Remove bolt securing outboard U-joint coupling on angle gearbox splined shaft.

(3) Slide torque tube inboard to remove outboard U-joint coupling from gearbox splined shaft.

(4) Slide torque tube outboard to withdraw inboard splined shaft from actuator drive.

(5) Remove flap drive angle gearbox (refer to Removal/Installation - Flap Drive Angle Gearbox).

(6) Sliding torque tube back and forth, work torque tube aft until it is free of wing trailing edge braces.

J. Install Flap Drive No. 5 Torque Tube.

(1) Start torque tube inboard beneath inboard flap outboard track through wing trailing edge braces and then slide back and forth as necessary to align torque tube ends with flap actuator drive and location of angle gearbox.

(2) Install flap drive angle gearbox (refer to Removal/Installation - Flap Drive Angle Gearbox).

(3) Rotate torque tube to align holes in outboard U-joint coupling with hole in splined shaft and slide torque tube inboard to engage splined shaft at inboard U-joint in actuator drive.

NOTE: Due to location of splines in relation to bolt hole in splined shaft, there is only one position of the torque tube in which the bolt holes will be exactly aligned.

(4) Slide torque tube outboard, slide U-joint coupling over splined shaft of angel gearbox, and install bolt securing U-joint coupling in place.

CAUTION: MAKE SURE THAT BOLT PASSES THROUGH HOLE IN SPLINED SHAFT. (IF U-JOINT COUPLING HAS A WITNESS HOLE, INSERT A PAPER CLIP OR LENGTH OF FINE WIRE. WIRE SHOULD ENCOUNTER SPLINED SHAFT.)

(5) Test flap system (refer to 27-4-0, Adjustment/Test - Flap Control System Functional Test).

NOTE: If flap drive No. 5 torque tube only has been replaced and no other rigging or adjustment has been changed, check flap operation per 27-4-0, paragraph 2.D. and steps 2.E.(3), 2.E.(14) and 2.E.(15).

K. Remove Flap Drive No. 3, 4, 6, 7 or 8 Torque Tubes.

NOTE: The procedures for removing and installing all of the above torque tubes are identical except for No. 6 which has a support bearing which must be removed and installed.

(1) Open shroud doors on under surface of wing in line with torque tube to be removed.

(2) Disconnect sprocket coupling at each end of torque tube.

(3) If removing No. 6 torque tube, remove four bolts and detach bearing support near center of torque tube from structure.

(4) Hold spring-loaded drive sprocket units firmly in place and move torque tube aside.

(5) Slowly release spring compression on drive sprocket units and remove units from flap actuator drives.

(6) Slide torque tube back and forth as necessary to clear wing trailing edge members and remove torque tube.

L. Install Flap Drive No. 3, 4, 6, 7 or 8 Torque Tubes.

(1) Check that flaps are in "full down" position and that flap control lever is positioned in 50° detent.

NOTE: Aft rollers on flap main carriages shall be 0.70 inch from making contact with emergency stops on lower flap tracks.

(2) Work torque tube into position between flap actuator drives.

(3) If installing No. 6 tube, slide bearing support over outboard end of torque tube.

(4) Slide spring over splined shaft of each sprocket drive and insert splined shaft into flap actuator drive.

(5) Install coupling chain and mount flexible cover over each sprocket assembly.

(6) If installing No. 6 torque tube, position bearing support and attach to structure with four mounting bolts.

(7) Test flap system (refer to 27-4-0, Adjustment/Test - Flap Control System Functional Test).

NOTE: If a flap drive No. 3, 4, 6, 7, or 8 torque tube only has been replaced and no other rigging or adjustment has been changed, check flap operation per 27-4-0, paragraph 2.D. and steps 2.E.(3), 2.E.(14) and 2.E.(15).

FLAP DRIVE ANGLE GEARBOX - MAINTENANCE PRACTICES

1. Removal/Installation - Flap Drive Angle Gearbox (see Figure 201)

A. General.

Procedures for removing and installing the flap drive angle gearbox in the LH and RH wings are identical.

B. Equipment Required.

(1) Spacer blocks 0.70 inch thick to locate "full down" position of flaps.

(2) Shop fabricated hook-shaped tool to assist in installing flexible cover on sprocket coupling assembly.

C. Remove Flap Drive Angle Gearbox.

(1) Open shroud doors on under surface of wing in line with angle gearbox to be removed.

(2) Remove bolt securing coupling on outboard end of No. 5 torque tube and slide torque tube inboard to clear coupling from gearbox splined shaft.

(3) Disconnect sprocket coupling at inboard end of No. 6 torque tube.

(4) Press sprocket against spring, move torque tube aside, and remove sprocket drive and spring from angle gearbox drive.

(5) Remove six mounting bolts to detach angle gearbox and remove gearbox from airplane.

D. Install Flap Drive Angle Gearbox.

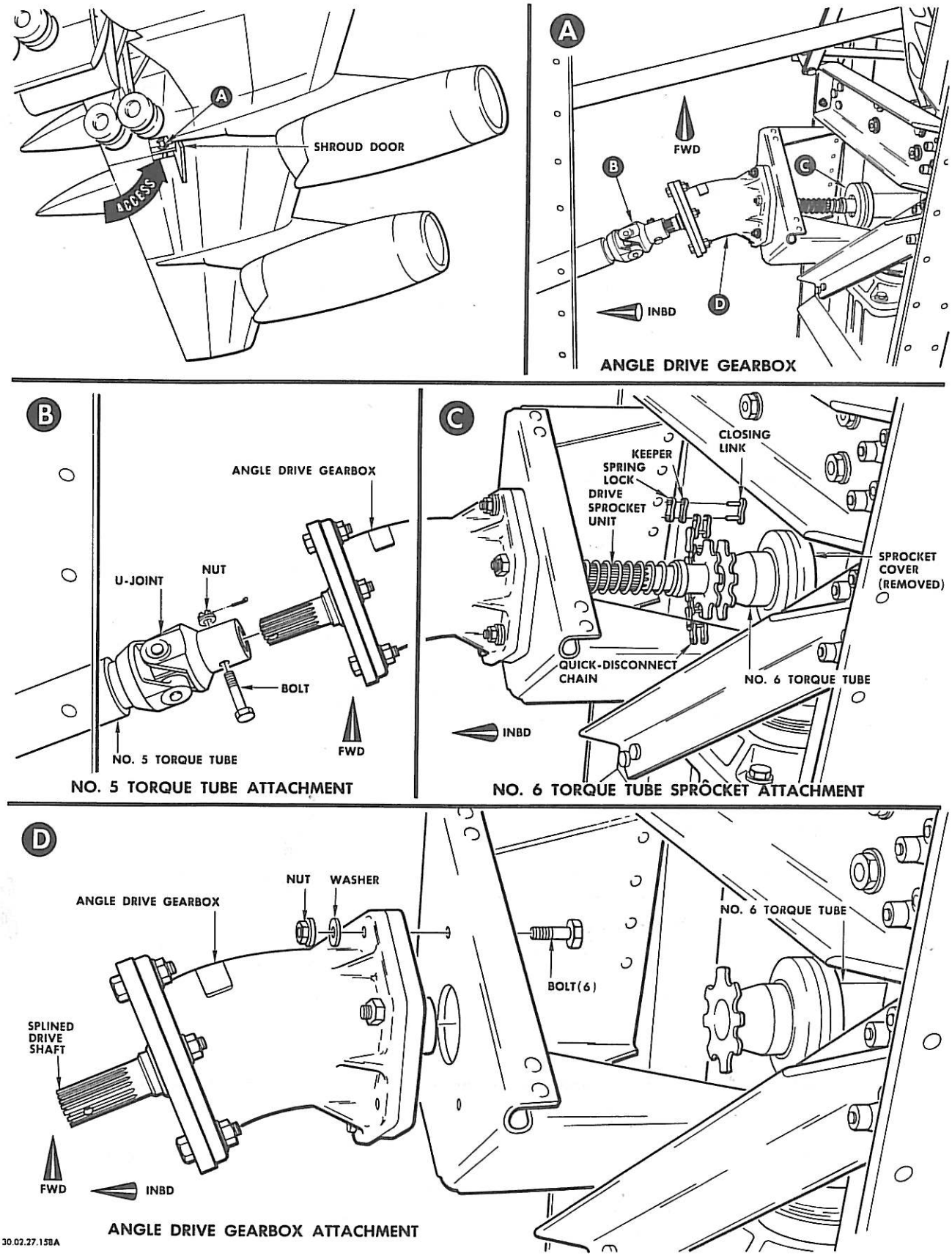
(1) Check that flaps are in "full down" position and that flap control handle is in 50° detent.

NOTE: When flaps are in "full down" position, aft rollers on flap main carriages should be within 0.70 inch of making contact with emergency stops on lower flap tracks.

(2) Position flap drive angle gearbox and install six mounting bolts.

(3) Rotate gearbox splined shaft to align bolt hole in shaft with bolt holes in coupling on outboard end of No. 5 torque tube.

(4) Slide coupling over gearbox splined shaft and install bolt to secure in place. Make sure that bolt passes through gearbox splined shaft.


A
SHROUD DOOR
ACCESS
A
FWD
B
C
D
INBD
ANGLE DRIVE GEARBOX
B
ANGLE DRIVE GEARBOX
U-JOINT
NUT
BOLT
NO. 5 TORQUE TUBE
FWD
NO. 5 TORQUE TUBE ATTACHMENT
C
CLOSING LINK
KEEPER SPRING LOCK
DRIVE SPROCKET UNIT
SPROCKET COVER (REMOVED)
QUICK-DISCONNECT CHAIN
NO. 6 TORQUE TUBE
INBD
NO. 6 TORQUE TUBE SPROCKET ATTACHMENT
D
NUT
WASHER
ANGLE DRIVE GEARBOX
BOLT(6)
NO. 6 TORQUE TUBE
SPLINED DRIVE SHAFT
FWD
INBD
ANGLE DRIVE GEARBOX ATTACHMENT
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NOTE: Due to location of splines on splined shaft in relation to bolt hole, it may be necessary to rotate splined shaft an additional 180 degrees in order to align bolt holes exactly.

(5) Insert sprocket drive with spring over splined shaft into drive coupling in gearbox.

(6) Position inboard end No. 6 torque tube, install coupling chain on sprockets and mount flexible cover on sprocked assembly.

(7) Test flap system (refer to 27-4-0, Adjustment/Test Flap Control System Functional Test).

NOTE: If a flap drive angle gearbox only has been replaced and no other rigging or adjustment has been changed, check flap operation per 27-4-0, paragraph 2.D. and steps 2.E.(3), 2.E.(14) and 2.E.(15).